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Spinning Spheres for Man-Made Lightning

By H. W. Tenney

Process Engineer, Westinghouse Electric and Manufacturing Company

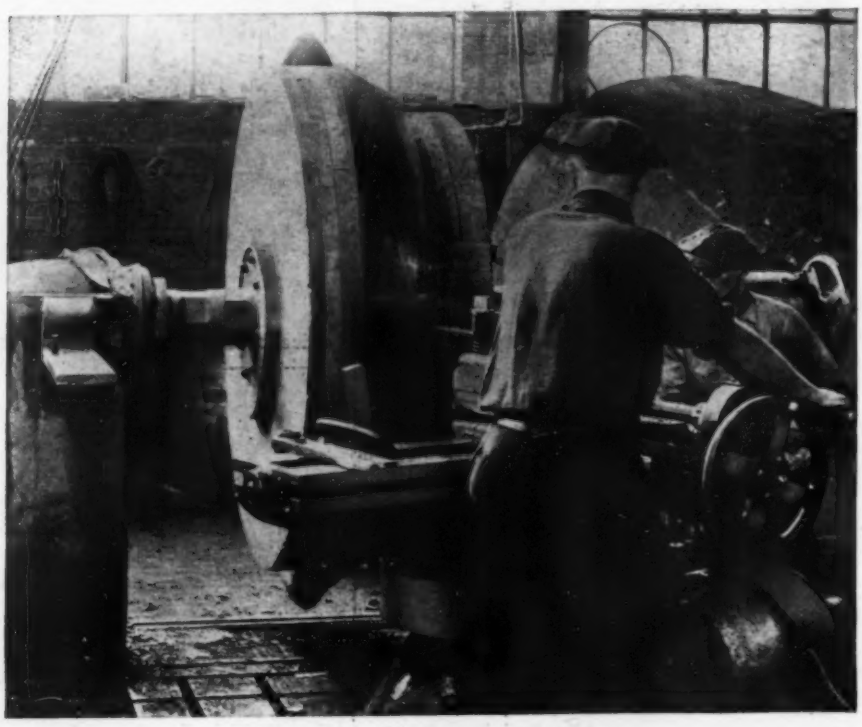
TO UTILIZE successfully the enormous natural forces which modern science has learned to concentrate, means of measurement must be provided. For measuring 1,000,000 volts of electricity as produced by high voltage transformers, the sphere spark gap, using spheres 100 cm. (39.3 in.) in diameter, has served as the standard. In high voltage work, just as with a 110 volt lighting circuit, the root mean square (r.m.s.) is the value used. Therefore when 1,000,000 volts r.m.s. at a frequency of 60 cycles is applied to the sphere gap, the maximum or crest voltage reaches a peak of 1,400,000 volts.

In order to prevent external influences from affecting the accuracy of the sphere gap measurements, the separation permissible is limited to one diameter. When the 2,000,000-volt lightning generator at the Westinghouse high voltage laboratory was planned, one of the problems was to design a sphere spark gap adequate to measure voltages of this order.

Preliminary calculations indicated that a pair of spheres 150 cm. (59.16 in.) would be required for measuring these high voltages. The manufacturing methods used in

producing smaller spheres were reviewed, and it was found that, in the manufacture of 50, 75, and 100 cm. spheres, used to measure high voltages, cast shells, which had undergone a number of very careful machine processes, were used. The 100 cm. spheres were made from cast hemispherical bronze shells approximately $\frac{3}{8}$ in. in thickness with male and female threads cut on the rims for assembly. The assembled shell was turned as a unit by a special set-up. A light cut was taken each time so that the casting strains would be gradually relieved. After the final cut, the spheres deviated only a very small amount from being perfect.

The turning operation was only one of the problems



The spinning process on one of the hemispheres is shown 50 per cent completed. One form is used for both halves

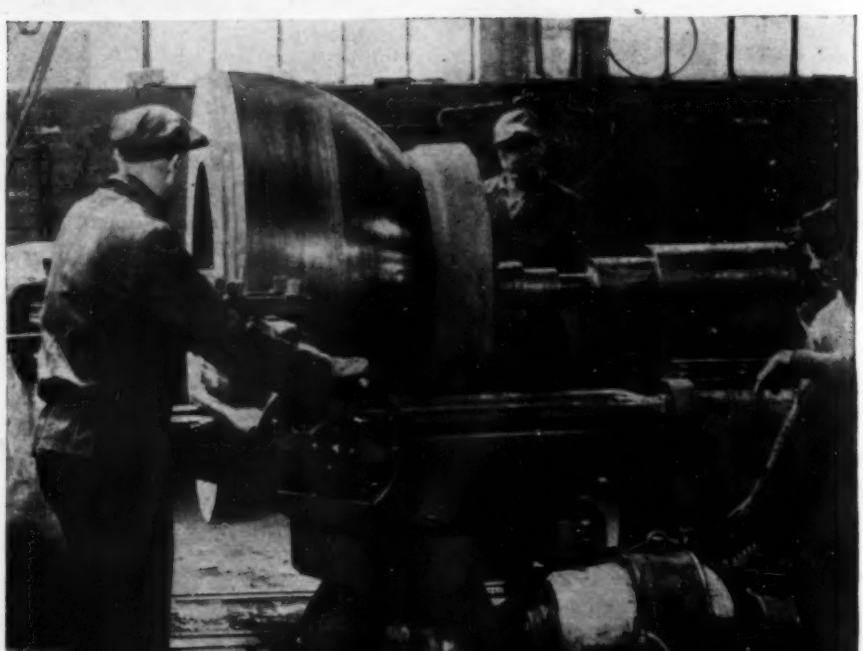
that had to be solved in the manufacture of these spheres. At first, considerable difficulty was experienced in obtaining good castings, free from blow holes, having walls of uniform thickness. Through the efforts of the foundry, very good castings were finally produced. A shell of bronze 100 cm. in diameter, having a wall $\frac{3}{8}$ in. thick, weighs approximately 475 lb., introducing problems of handling and mounting.

When the construction of a pair of spheres 150 cm. in diameter was considered for use with the 2,000,000-volt surge generator, it was realized that these problems would be greatly magnified. Assuming that a shell was cast, which when finished would have a $\frac{3}{8}$-in. wall, the weight of the sphere alone would be 1,400 lb. A study of the methods of casting and machining indicated that the cost of spheres so made would reach an excessive figure.

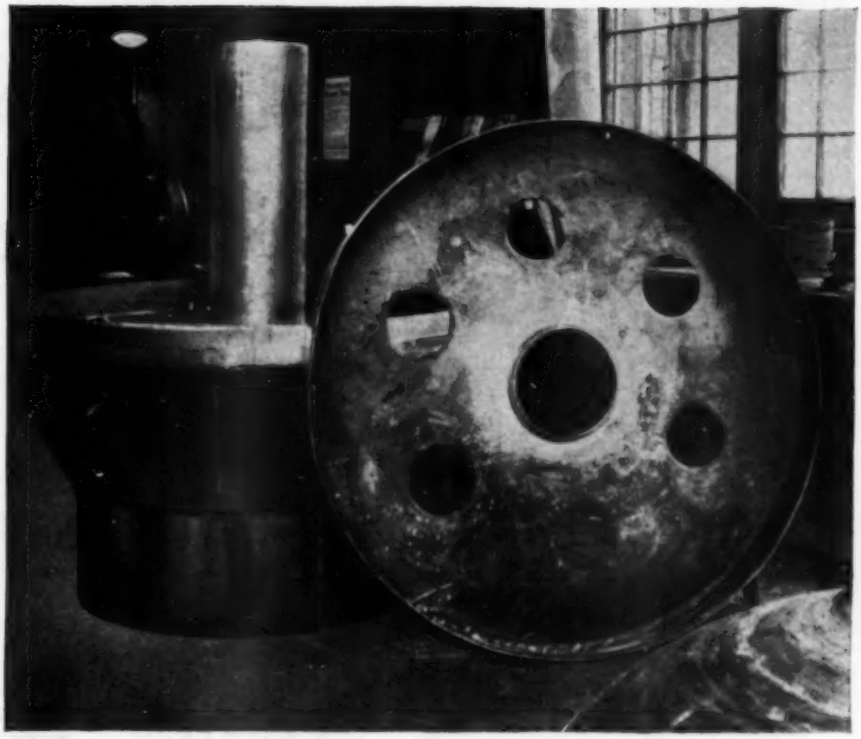
In the construction of some experimental apparatus some time ago, several large spinnings were used, and this suggested the possibility of using spun sections in making up spheres of large diameter. Accordingly, a design was worked up and showed that spheres spun of No. 12 gage copper would weigh 250 lb. with no internal bracing or stem for mounting. At first, it was felt that the forms about which the shell was spun should be used to brace the shells internally. However, experienced spinners suggested that substantial spheres could be made by providing internal bracing in two directions. Consequently, this design was adopted, and the construction of the sphere undertaken.

The spinning process was somewhat more involved than anticipated, because the blanks were greater than the swing of the lathe and their edges had to be cramped. These blanks were originally 96 in. in diameter but it was found that they could be reduced to 85 in. Even then they exceeded the swing of the lathe. As the copper hardened very quickly when worked, it was necessary to draw the temper many times before a shell was completed.

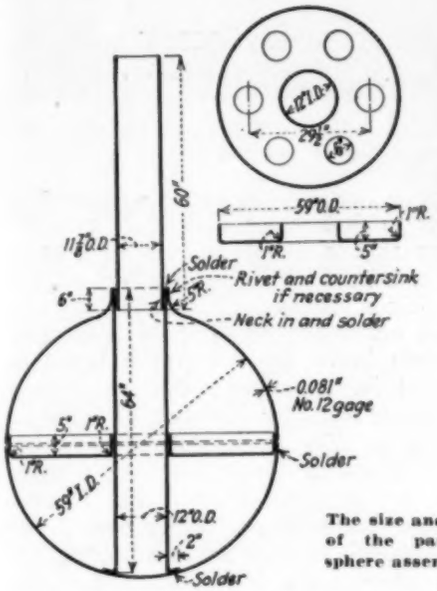
The bracing was accomplished by



The spun sphere is made of 12 gage copper; a casting this size would weigh more than five times as much



The sphere is axially braced by means of a copper cylinder. A flanged spider mounted on this cylinder furnishes circumferential support and provides a means of joining the hemispheres. These various members are assembled by soldering



The size and relative location of the parts forming the sphere assembly are shown in detail

using a spider, the flange of which was soldered inside the periphery of the lower shell of the sphere. The copper cylinder above this spider extended to the inner surface of the shell and had several ears bent at right angles which were soldered to the shell. A flange which was upset around the inner hole of the spider was secured to the cylinder by soldering. This tube was of sufficient length to extend into the neck spun on the upper sphere and was soldered to it. The upper shell was also soldered to the portion of the flange on the spider left extending above the rim of the lower sphere. The total weight of the assembly was a little over 400 lb.

The success of this construction was contingent on the accuracy with which these large spinnings could be made. This work was undertaken at one of the plants of the Aluminum Company of America where the spinnings were made very satisfactorily. A tolerance of $\frac{1}{4}$ in. in the diameter of the finished sphere was allowed in the specifications, but measurement of several diameters with micrometers showed a maximum deviation of less than $\frac{1}{16}$ in. Furthermore, the work of assembly at the East Pittsburgh Works was greatly simplified, because very little working was required to fit the spider within the two shells forming the sphere.

Several methods of cleaning the spheres were tried before resorting to the use of acid. The use of wire brushes, motor-driven buffers, and motor-driven burnishing plates was found to be ineffective and slow. Washing with acid readily removed the dirt and oxide. When the spheres were clean, further action of the acid was arrested by thoroughly washing with water to remove all traces.

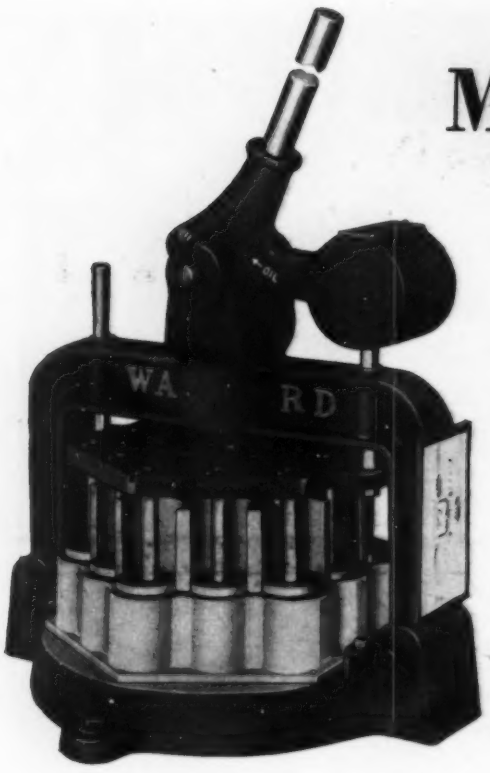
Is the Toolroom Passing?—*Discussion*

By L. O. Brown
Toolroom Foreman,
Holcomb & Hoke Manufacturing Company

GEORGE GREETHAM on page 917, Vol. 71, of *American Machinist*, makes the statement that there will be always "a little toolroom in a corner." I agree with him. Although many signs seem to point that way, the toolroom is not passing on. It will always remain as a very important adjunct to production.

Many tool parts and tools have become standardized and are available commercially much more cheaply than they can be manufactured in the individual toolroom. But, on the other hand, no standardized part will, under ordinary conditions, fit into every toolholder in every toolroom without slight modifications and alterations. Sometimes, highest efficiency can be obtained only by alterations after the tool is installed. No contractor can be expected to make allowances for a condition which he does not know exists. Consequently, a toolroom in the plant must make alterations, and may be able to assemble the tool from standard parts and a few special fittings to make a much more satisfactory tool in the end.

In addition, a fairly large force will be required for maintenance, repairs, and emergencies. This sort of work fluctuates widely, but a sufficient force to handle it must be kept on hand at all times. Therefore, other work must be done to keep this emergency force busy when otherwise unoccupied. The toolroom may also be made to serve as a development laboratory for the improvement of processes, methods, and machines.



Ward pie-dough dividing machine

Machining a Honeycomb To Close Tolerances

By CHARLES M. REESEY
The Cincinnati Milling Machine Company

TO COMPETE successfully for use in an industry manufacturing a low-priced commodity, baker's equipment must be produced in large quantities economically and with a minimum amount of attention. Such qualities argue a degree of accuracy in manufacture not to be expected ordinarily in this class of equipment. For example, Ashley F. Ward, Inc., builds a pie-dough dividing machine on which tolerances of 0.0005 in. are demanded for the distances between centers of the nineteen cylinders in the cutting plate.

For convenience in machining and to insure perfect matching of the cutter plate and the outer casing, these parts are cast in one piece, as shown in Fig. 1. They are separated later. In this illustration the portion within the dotted line is the cutter plate, which moves up and down when actuated by the arbor of the divider. The outer portion, outside of the dotted line, constitutes the pan-like container for the dough. Nineteen plungers from 0.0015 to 0.0025 in. smaller than the $2\frac{5}{8}$-in. cylinders press out the dough after the honeycomb section cuts it into small circular sections.

Prior to being placed on a Cincinnati 2-M plain miller for the four operations to be described, the casting is faced and turned at *A* and *C*. It is clamped to a heavy faceplate, which is in turn screwed on the nose of the 12-in. dividing head. It is located by four hardened pins in the faceplate and is clamped in position by six dog clamps. A dial indicator is used for setting the plate accurately to the spindle.

The first operation is milling the sides to 5.523 in. to the center, as indicated by the heavy dotted line *D*. The time required for this operation is 30 min., using a $1\frac{1}{2}$-in. end mill at a feed of $\frac{3}{4}$ in. per min. and at a speed of 137 r.p.m. All holes are rough bored in the second operation, $\frac{1}{8}$ in. stock being removed. The set-up is similar to that shown in Fig. 2, with the exception that a single-end boring bar is used at a 1-in. feed and at a speed of 137 r.p.m. Time required is 35 minutes. In the third operation the nineteen holes that were rough bored are now finish bored to 2.625 in., plus 0.003 in. or minus 0.001 in. on the diameter, with a center-to-center distance of 2.75 in. plus or minus 0.0005 in. The work is mounted on the faceplate, and the double-end boring bar with a taper shank is mounted in the arbor adaptor that fits the National Standard spindle nose and taper hole. The cutter nearest the adaptor is used for chamfering the edge of the hole, whereas the other cutter does the finish boring. A feed of $\frac{3}{4}$ in. at a speed of 183 r.p.m. is employed. The total time for this operation is 115 minutes.

Care must be exercised in the finish boring operation. The center-to-center location is found in the usual way and proven. All of the distances from the center of the dividing head are obtained by means of a duplex dial on the table feed screw to compensate for the tolerances at the different points. This dial was made by the above company and consists of a main dial

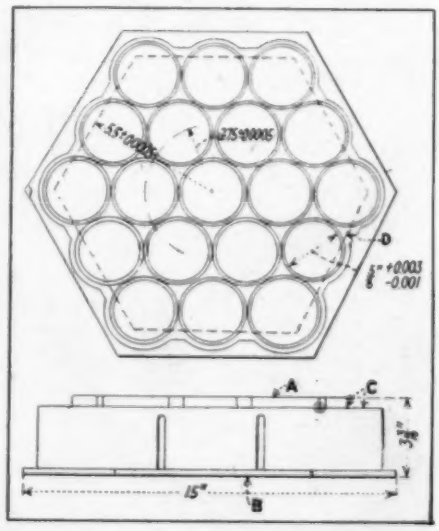
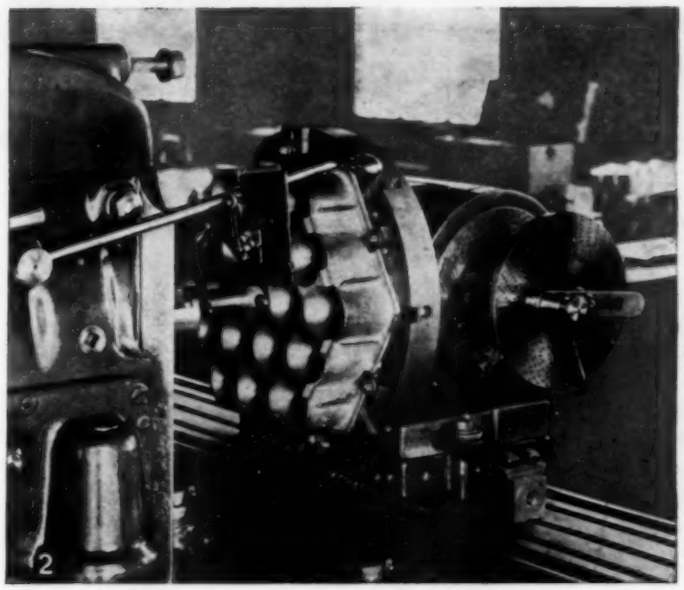


Fig. 1—Diagram of the casting that embodies the cutting knife and the outer casing. The knife is bounded by the dotted line. It is sawed out as the last of the four operations



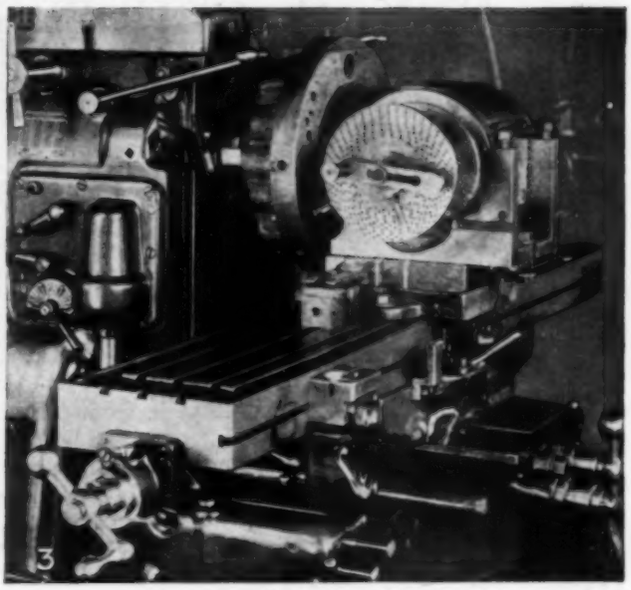


Fig. 2—Set-up used for finish boring the cutter plate holes on a Cincinnati Type 2-M plain miller with universal dividing head. Fig. 3—Set-up for checking the center-to-center distances between the finish bored holes

provided with a clamping screw mounted directly on the feed screw in the same position as the regular dial. A second ring is frictionally mounted on the first ring and numbered both right and left from zero, in 250 equal divisions. This second ring may be returned to zero at any time without moving either the feed screw or the clamped dial. Thus it is possible to bring the table back exactly to the original zero position without introducing any error of resetting the dial. Also, since the numbers are on an independently movable ring, the dial may be brought to zero at any given table position, and a new location may be measured from that point by means of the feed screw without the operator having to make additions and subtractions. The new distance or movement is determined mechanically and is checked, from time to time, by means of the dial indicator and the gage rods. After the holes are finish bored, the fourth, and last, operation is the separating of the honeycomb from the outer ring by slitting with a milling saw that is 7 in. in diameter by $\frac{1}{16}$ in. thick.

Zinc Plating Aluminum Parts to Prevent Seizing

THREADED parts of aluminum and its alloys when assembled are prone to seize, or freeze to each other. One satisfactory method to eliminate this difficulty and still retain the lightness of parts made of this metal is to plate the threaded surfaces with zinc. The following procedure has been found to give an entirely satisfactory coating of zinc on aluminum and its alloys.

The object to be plated is first dipped in a 10 per cent solution of hydrofluoric acid, then rinsed carefully in clean cold water. Following this, it is dipped in cold concentrated nitric acid and again rinsed thoroughly in water. Upon removal from the rinse water, the object is immersed immediately in the plating bath. The cleaned metal surface should not be touched with the hands, since a film of grease or other matter will prevent the proper adherence of the zinc coat.

The plating operation is accomplished in a bath the composition of which is based on recommendations found in the Transactions of the American Electrochemical Society, Vol. 41, page 363 (1922), using a current of 4.3 amperes and 5 volts. A satisfactory deposit will be obtained in from five to ten minutes.

The bath composition should be prepared as follows:

	Ounces per gallon
Zinc Cyanide	6
Sodium Cyanide	6
Sodium Carbonate	6
Sodium Fluoride	2
Gum Arabic	$\frac{1}{8}$

The life of the zinc plating may be extended by the application of anti-seize compound. The two preventatives should be employed in conjunction if the protection offered by either one, used singly, does not overcome conditions of severe pressure or of frequent assembly and disassembly.

According to Richard Schneidewind, of the University of Michigan, in a research bulletin on chromium plating, the hardness of chromium as compared with that of other metals is as follows: Chromium, 2,000; Case-hardened steel, 1,950; Steel shafting, 750; Cobalt, 625; Swedish Iron, 408; Bronze, 244; Babbitt, 208; Copper, 78.

EXECUTIVE · FORUM

Should Price or Payroll Be Cut?

JOHN GALLOWAY looked troubled as he entered the president's office. During his eighteen years with the Mid-City Machine Works, where he had climbed from the position of boring mill operator to that of works manager, he had become known for his quick smile and ready wit. Despite his advancement, the shop men regarded Galloway as one of them; they knew that in carrying on his executive functions he never lost sight of their interests.

Mid-City's president, George B. Coakley, at once noticed the absence of his works manager's habitual good humor. "You look as though you'd lost your best friend John. Where's the cheerful grin, this morning?"

"I haven't lost a friend yet," replied Galloway, "but the sober expression means I'm afraid I may lose several. The temporary falling off of orders during the holidays is now being felt in the shop. During the past two years, I have built up a force of real mechanics, and I hate to lose a single man."

"I have been aware of this situation, John," said Coakley, "and no one regrets more than I the periodic slumps which cause the loss of valuable men. However many lines of business are subject to these fluctuations, and in our line, they seem inevitable."

"In this particular instance, it might be avoided," Galloway pointed out. "That's what I wanted to see you about. The Dobbs Pump Company's inquiry for special machine work is now on my desk for approval. These people have the castings ready, and the work is mostly large planer operations. That is just what the shop needs. A job like this would hold my force together for another two months. By that time our regular line will be selling again."

"Well, I certainly hope we get the work," assured Coakley.

"Yes, but I am almost sure that we won't with a quotation based on the estimate as it now stands. The time appears to be figured correctly, but the burden puts the final total out of sight. As a matter of fact, I was talking to young Dobbs Tuesday night at the club, and I gathered that the Brown-Kellogg people need the work as badly as we do. They are apparently ready to forget a little of their overhead to secure this work."

What Do You Think About This Executive Problem?

There are few companies which, at one time or another, do not meet with the same situation as that of the Mid-City Machine Works. Here we have the viewpoint of the shop man versus that of the accountant. What should be the really rational view?

***American Machinist* will pay for acceptable contributions discussing this subject. Why not submit your personal ideas?**

"Let's get Norton in on this," suggested Coakley, calling up the comptroller.

"This question has come up repeatedly," stated Norton, after the situation had been thoroughly explained to him. "The particular job in question uses some of our largest equipment, and the overhead is correspondingly high. Our costs are based on the investment in each machine tool, and the floor space occupied by it. Burden charges figured on this basis are real items; our regular line is priced to take only its fair share. The only satisfactory solution, I have been able to find, is to let each job stand on its own feet."

"That seems like sound reasoning," assented Galloway, "but if you had to go through the grief of building up an efficient shop organization, you would grasp at any straw to hold it together. We all know that it costs plenty to train men. Now that we have a good force, we certainly should stretch a point to keep it intact."

"There may be some situations where waiving a portion of the overhead is excusable," objected Norton, "but many a shop has allowed this practice to become a habit. And at the end of the year, their books are likely to show red figures."

DISCUSSION

OF PREVIOUS PROBLEMS

How Long Should Records Be Preserved?

Keeping records of business is one form of system which can very easily become topheavy and resolve itself into the system's running the business. Like many other practices, the fact that it must be watched carefully is no reason for abandoning it altogether. What to file and how far back to file it are the essential questions.

Looking back over eleven years, I can see repeated efforts to keep filed various records which rapidly grew cumbersome, required expensive space and equipment, and considerable clerical help to maintain. In most cases, reference of any real value was made to the old files about in the ratio of 1 to 1,000, making the proposition an expensive luxury. It is a question whether it wouldn't be better to settle a lawsuit or a complaint in favor of a customer, because of inability to prove your side of the story, than to spend probably more than the settlement would cost, trying to keep all the records over a period of years. The chances are a settlement, forced in this way, would be worth its cost in accumulating good will.

I believe, many businesses would profit considerably by overhauling and establishing a restricted system of record keeping on the basis of real need and value. Make someone responsible for a periodic checking of the record system to keep it from accumulating dead wood. Some classes of records are very essential today, while the same classes are absolutely unneeded a year from now.

—W. A. KIRKPATRICK,
Upper Darby, Pa.

Who Should Do the Estimating?

Undoubtedly the foremen are in a better position to say how long a given job will take in their departments than an estimator who is confined to his desk, since the latter cannot possibly be as familiar with all the details and limitations of each machine and man. A great deal can be done toward overcoming this weakness by standardizing and recording machine capacity data of all shop equipment, correcting feeds and speeds in use, and providing both the estimator and the shop with the resulting data.

Such standard data enables the estimator to take care of the average job. On the more difficult jobs, the foreman may be called on to give his expert opinion. It is better that he not be called on too frequently for this kind of service, as his primary function is that of supervising and training the men under him. If these important and cost cutting duties are forced into the background by the necessity of performing a mass of clerical work such as is involved in preparing estimates, the efficiency of the plant will suffer.

Other reasons why the foremen should not prepare estimates are the facts that as a class they are inclined to:

1. Discount the effects of competition.
2. Underestimate the overhead items involved.
3. Be usually poor clerks.
4. Be seldom in close touch with customers.
5. Have poor office facilities.
6. Play safe and estimate high if they think they can get by with it.

—W. B. LINCOLN, *Chief Engineer, W. J. Savage Company.*

Fitting the Older Worker for His Job

The older worker is generally rich in experience and the wisdom born of it, and is usually well qualified to counsel and guide. The training of apprentices and personnel is a department in which he should be especially valuable. "Even the best of us are dirty clouts about our buried talents." The older are more likely to perceive the buried talents and to devise means to resurrect them into fruitful action.

Frequently the older worker is a father, sometimes a grandfather, and has become thoroughly acquainted with his own faults. These things help to give him a kinder and more sympathetic attitude to his fellows, to see more clearly the snares which beset them, and the best means by which they can be helped. He is not so likely to overlook an important aspect of a problem, and he sees more impartially.

I well remember with great pleasure, one of these old employees with his courtesy and consideration and his genial justice. His conversation, was a happy combination of entertainment and instruction, rich in humor and wise anecdote. He was a strong radiating influence, promoting the good feeling and harmony, all just as essential to the efficient running of human machinery, as lubricating oil is to the highest production of the mechanical. As a result of acquaintanceship with him, my respect for his employers considerably increased.

Happily, an exception is the old fellow who is a cantankerous blighter, mistaking the faulty functioning of his liver for righteous indignation, and his jealousy of the young for virtue. We are prompt to perceive personal influence in the negative direction of making trouble. We need to be equally quick in recognizing it in its positive beneficent action in eliminating, or side tracking, mischief. In this connection, we should remember that the influence of the older employee is generally one of stability, and that his discharge is an advice to other employees to seek a wiser and more generous employer, which means an increase in the company's labor turnover cost.

Suggestively significant is the fact that parallel with the able and helpful editorial, "Pensions or Poorhouses," in the *American*

Machinist, is one devoted to Thos. A. Edison's services to electrical illumination and his unusually long life. Many would like to have to the credit of their first fifty years what he achieved after he reached his fiftieth birthday.

Those, who rule out of industry men over forty and fifty, should consider this thoroughly and therefrom derive some mental illumination. Thus illuminated, they may then scrutinize intelligently some of these men over forty and fifty with their erect heads, their alert and thoughtful eyes, and their resolute faces rich in character and experience.

—J. J. WOFFINGTON,
Lillington, England.

Should Estimates Be Given to Operatives?

What good are budgets or estimated cost figures if the men who are directly dealing with the operations do not have a knowledge of them? The man sitting in the office cannot expect his estimated figures to be met unless he passes on his ideas to the shop.

Now and then, I get the opportunity to visit some of our modern shops, where scientific system and not too much red tape are used. In one of them, an up-to-date jobbing shop, I found a system running which would be profitable in any establishment if fitted in correctly.

When a large concern sent in a set of drawings, requesting quotations on some special machine, the man estimating the job would break it down into its various units, pricing each one, from which the total cost would be derived. Upon completion of this work, he would consult the foremen who were directly concerned with the job, and they in turn would advise where shortcuts could be put into effect. After receiving the order for a number of special machines, the engineer who had estimated the job would receive a number of sets of drawings which he would cut up so that a single detail would be shown on each cut. On the backs of these cuts he would detail the various operations, the estimated time involved, what machines should be used, and the proposed cost of each operation. These cuts in turn would be routed to the shop foremen who would check them carefully and turn them over to the machines on which the operations were to be performed.

When the operator was about to start on a new operation, he would scan the back of print, noting the time allowed, and if he considered that it was wrong he would call the attention of his foreman to it. The foreman in turn would study the situation, and if he thought it was wrong, he would advise the estimating department at the end of the day.

In a game of sport there is a mark to shoot at if you would win; then why should there not be a mark to shoot at in the factory? That's why I believe that every man in the shop should know what part his work plays in the betterment of the whole, and that is why he should have the figures placed before him to shoot at. In time this method eliminated inadequate equipment, improper tools, mediocre tooling up of the jobs involved, and created a spirit of co-operation which is not found in many jobbing shops.

—FREDERICK SCHMIDT, *Industrial Engineer, Western Electric Company, Kearny, N. J.*

Making a Manager Out of a Foreman

The old time foreman was responsible for just about everything pertaining to his shop and had to find time for hiring, firing, routing, dispatching, inspecting, keeping costs, and maintaining equipment, in addition to supervising and directing the employees under him. The tendency of modern management has been to divest him of all duties except those of supervising and directing. The results have been highly satisfactory, and to burden the foreman with responsibility for financial matters, would be a step backwards.

The idea of making allotments for expenses is so old that it may almost be called "ancient," and it has seldom produced satisfactory results. When the writer was running a machine in a railroad repair shop, the management conceived the idea of making an allotment each month, for the expenses of each shop and roundhouse, and it worked out just as such a shifting of responsibility might be expected to work. Each Master Mechanic and Shop Superintendent tried to run just a little over the allotment, so that the amount would not be reduced for the next month. The shops were run in very much the same way as the house of the bride, trying to keep within her budget, only in reverse order. The first part of a month saw the shops running on reduced time, but with no reduction in force, and during the last week of the month everyone would be working over-time, with pay at time and a half.

A far better method was found on another railroad, where the management, instead of shifting the responsibility, accepted it fully and planned accordingly. Standards of time were set for each operation, and thus a foreman knew how many man-hours he had to spend on a job, and a bonus system helped him to accomplish the desired result. These standards were not changed unless justified by improvements in tools, machines, or methods. Blueprints, sent out each month from the general office, showed each foreman, master mechanic, and shop superintendent just how efficiently operations were performed. Conferences, which were held frequently, brought out the reasons for low efficiency, and it was then up to the management to supply the remedies. One result was the discarding of considerable old equipment, and the purchase of modern machines.

This method, and modifications of it, have proved successful in many cases in various industries. The foremen are given something to aim at, instead of having their duties increased.

—C. J. MORRISON, *Consulting Engineer, Meyer, Morrison & Co., Inc.*

Tooling for High Production Over a Long Period

By H. P. LEONARD

High lights of fixture design and machine modifications developed for the production of Studebaker transmission cases

THE transmission case of the Studebaker "President 8" model has been subjected to no radical changes in the past year. It has been possible, therefore, to design fixtures with an attention to detail, and for a permanency not possible in most automotive products. The machine tool equipment used to produce this part is largely standard, and the fixtures represent carefully thought out details, rather than novelty of design. The methods used, therefore, may serve in other than automotive products.

Twenty-two transmission cases are completely machined each hour. To accomplish this, 32 machines are necessary in the line, involving about 25 different operations. The machine line is located in a well-lighted shop, and the castings are transferred from one operation to the next on a roller conveyor that runs the length of the line. Storage space is provided at each end of the line for rough and finished castings, respectively.

The part itself is shown in Fig. 1, and in Fig. 2 is shown the fixture for holding it on the bed of a converted turret lathe for the first operation, which is to rough and finish bore the two main bearing holes and to face and chamfer the front bearing. Means for automatically centering the piece in the fixture are included in the design. As the design shows, the centering principle involves the use of adjustable studs mounted on bronze slide blocks that are movable in and out by means of right- and left-hand screw threads on a handwheel spindle. The base of the case is positioned by other capscrew studs which bear against the lower part of the case. The work is locked in place by the pivoted strap *A*, while studs *B* take the boring thrust by bearing against pads on the bell-mouth part of the casting.

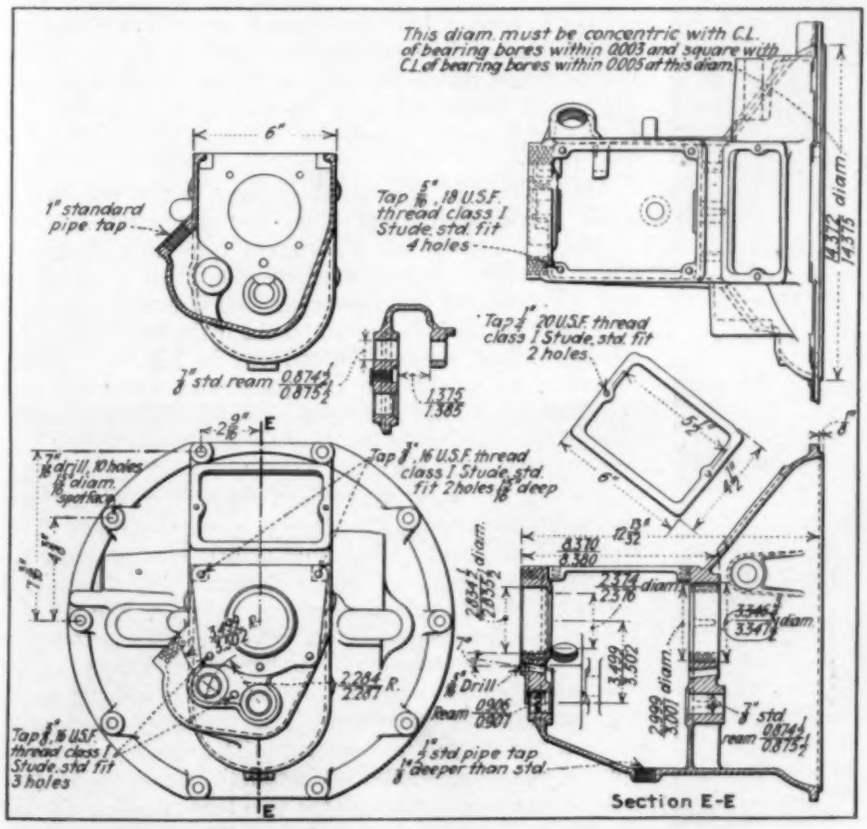

This diam. must be concentric with C.L. of bearing bores within .0003 and square with C.L. of bearing bores within .0005 at this diam.
6"
1" standard pipe tap
Tap 5/16"-18 U.S.F. thread class 1 Stude. std. fit 4 holes
4.312 4.313 diam.
Tap 3/4"-20 U.S.F. thread class 1 Stude. std. fit 2 holes
7/8" std ream .8744 .8752
1.375 1.385
5.2"
6"
4 1/2"
Tap 3/8"-16 U.S.F. thread class 1 Stude. std. fit 2 holes 1/2" deep
.7" drill, 10 holes 1/8" diam. 1/8" spotface
2.284 2.287 R.
Tap 3/8"-16 U.S.F. thread class 1 Stude. std. fit 3 holes
7/8" drill Ream .0906 .0911
1" std pipe tap 1/2" deeper than std.
Section E-E

Fig. 1—Transmission case for the Studebaker "President 8" engine. With a production line developed after considerable experiment, 22 cases are completely machined per hour

Once this semi-final boring is done these main bearing seats serve as the chief locating points for nearly all subsequent operations. For example, in the second operation, which involves the facing of the rear bearing boss in a turret lathe, a special chuck is used, carrying a mandrel having two diameters, upon which the casting is mounted and revolved. This construction is shown in Fig. 3. The end of this mandrel is counterbored and has a bushing inserted therein to engage the pilot on the two turret tool positions. In the first position the piece is rough faced, and in the second, it is finish faced and chamfered at 45 deg. The piece is gripped and held on the spindle by two fingers that are forced out by a plug with tapered end and which grip the casting inside the front bearing.

This faced rear bearing now acts as a bearing surface for clamping on a vertical spindle carried as a special fixture on a face milling machine. The operation is

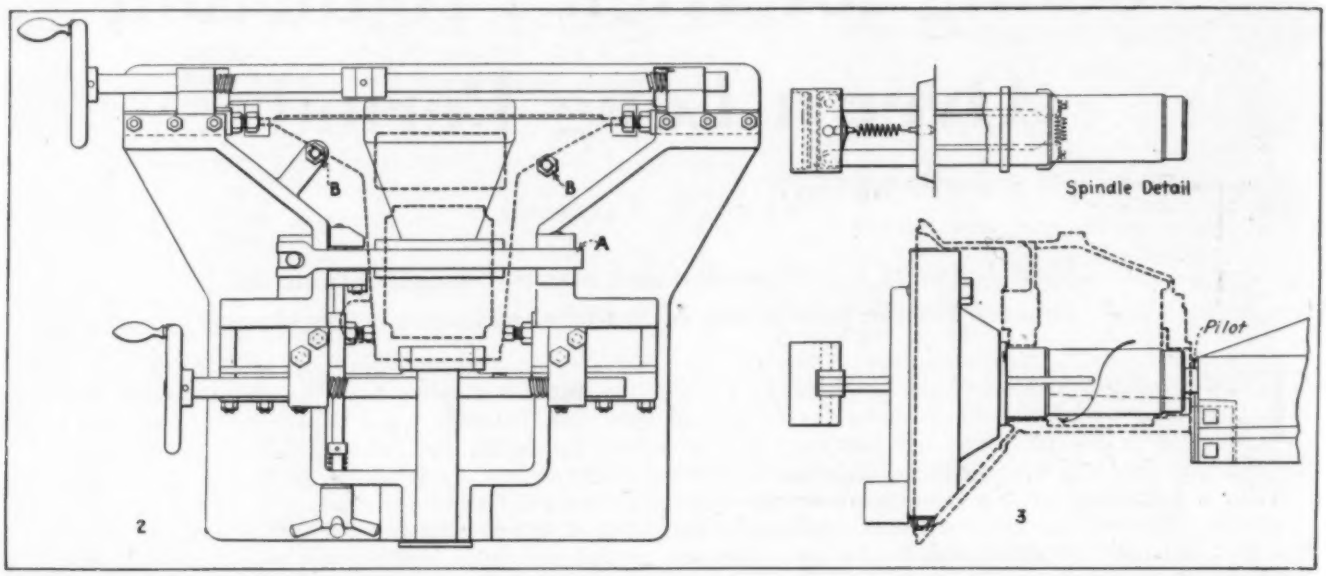


Fig. 2—Fixture for holding the rough transmission case casting for the first operation in which the front and rear bearing lip diameters are bored. Fig. 3—Tool set-up for rough and finish machining of the rear bearing face, showing the special extended spindle. Two fingers cammed out of position by a taper plug grip the work at the front

Fig. 4—In order to mill the coverplate seat on the transmission case, the piece is located on vertical spindles that engage the previously bored bearing diameters. One casting is milled at a time, then the table is indexed 180 deg. and the new casting rapidly advanced

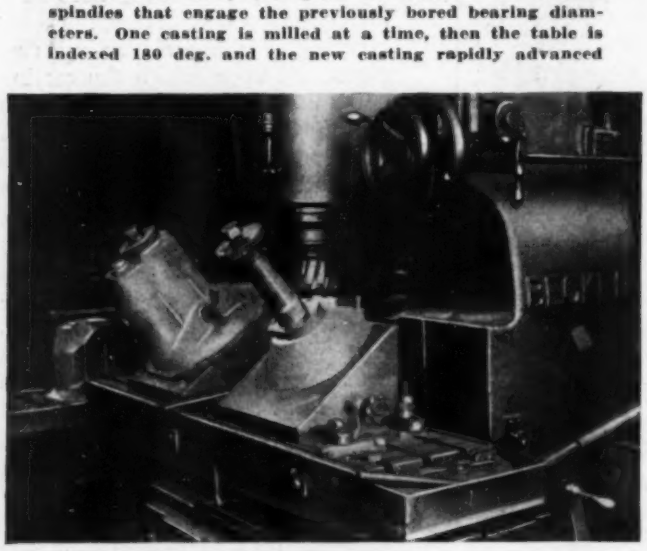


Fig. 5—Milling of the handhole cover seat is performed in a vertical-spindle machine, locating from the main bearing holes as before

facing the coverplate seat and is illustrated in Fig. 4. While one piece is being milled, the other is being loaded. Upon the completion of the cut the table is indexed 180 deg. by hand, locked, and the new piece is rapid advanced into the cutter. In this view the roller conveyor previously referred to may be seen in the background. Bars *A* which extend like the prongs of a fork from the hinged bracket *B* engage the two flats on the rim of the bell-mouthed clutch housing, or flange of the case, and prevent it from revolving on the upright spindle. A C-washer is used to facilitate clamping of the piece on the spindle.

The milling of the handhole face in the bell-mouth, while similar to the operation just described, involves a different fixture and a different type of milling machine, a vertical spindle machine instead of a horizontal one. An inserted-tooth cutter is used in both cases, however, and the piece is located on the main bearings. This second milling set-up is illustrated in Fig. 5. In this operation no indexing is necessary, and while one case is in the cut, the other is being loaded. The transmission case is set at an angle to bring the hand hole cover seat into a horizontal position.

For the following operation, which is rough turning the bell-mouth flange, a Warner & Swazey turret lathe has been modified. The same principle of locating on the main bearings has been maintained, but the casting instead of being carried on the faceplate of the lathe is carried on a revolving center in one of the turret stations. The construction is indicated in Fig. 6 which shows the bronze radial bearing and the ball thrust bearing employed in this head. It is necessary, of course, to lock the turret in position. The other supporting spindle is piloted in the lathe spindle, using an adapter bushing. Drive is through the two lugs *A*, while the lug B drives the secondary spindle. The cutting tool is mounted on the cross-slide turret.

In the next operation the case is mounted in a turret

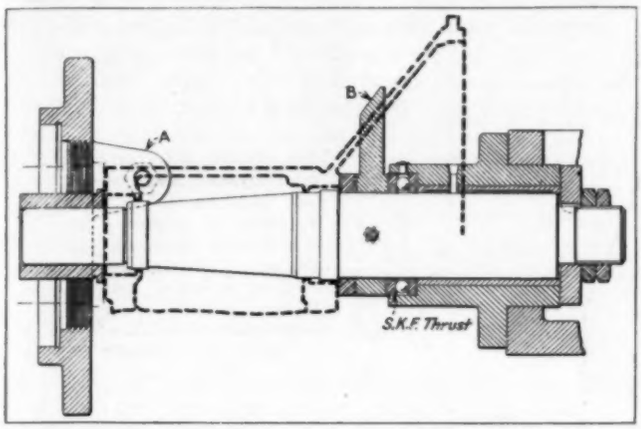


Fig. 6—Auxiliary spindle carried in the turret head of a lathe designed to support the piece while the bell-mouth flange is being turned by tools in the square turret post

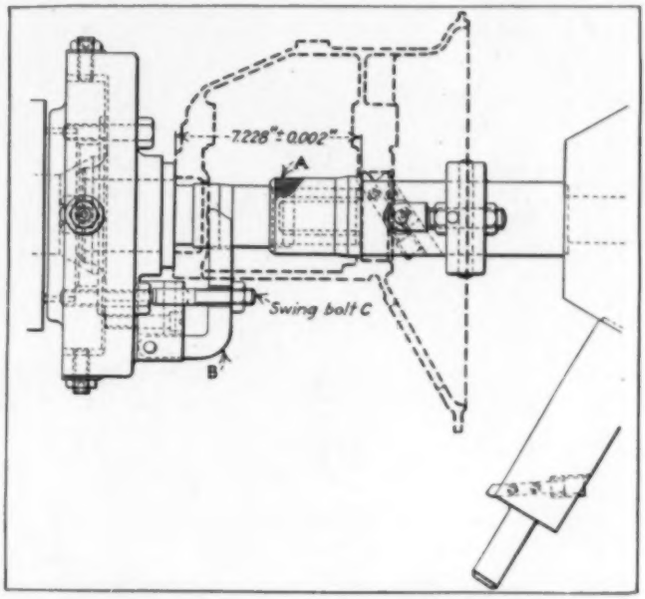


Fig. 7—Turret tool layout and the method of chucking the transmission case while the front bearing seat is being bored and chamfered. Because the small diameter bearing is slipped over the auxiliary spindle first, an adapter sleeve must be used for the second bearing

lathe similar to the set-up shown in Fig. 3, and the rear bearing is rough bored in the first turret station and finish bored and faced at the bottom and chamfered at the outside in the second station. In the first operation on the piece, the shoulder diameter was bored, and this last operation completes the rear bearing seat except for reaming which follows later. The piece is then carried to another turret lathe with two tool stations practically identical, except for size, with the set-up for the rear bearing, and a similar operation is performed on the front-end bearing. Fig. 7 shows the tool layout and the method of chucking the transmission case. As usual, the part is located on the previously bored main bearing shoulders, but because the small bearing goes in first, a somewhat different construction must be used for the mounting spindle than has been illustrated heretofore. In this case an adapter *A* is slipped over the extended spindle end after the piece is placed in its approximate final position. The largest diameter of this sleeve engages the casting at the 3-in. bearing shoulder diameter. Two pins in the spindle engage slots in the sleeve and prevent it from revolving. At the same end of the extended spindle is a hardened steel adapter that acts as

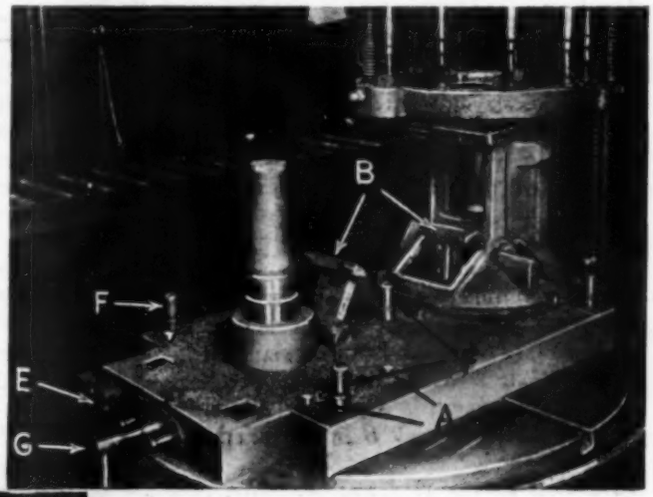


Fig. 8—The main bearing bores also serve as the chief locating axis when the ten holes, $\frac{7}{16}$ in. in diam. are drilled in the flange. Pins A support the flange and hinged plate B is used to clamp the piece in position

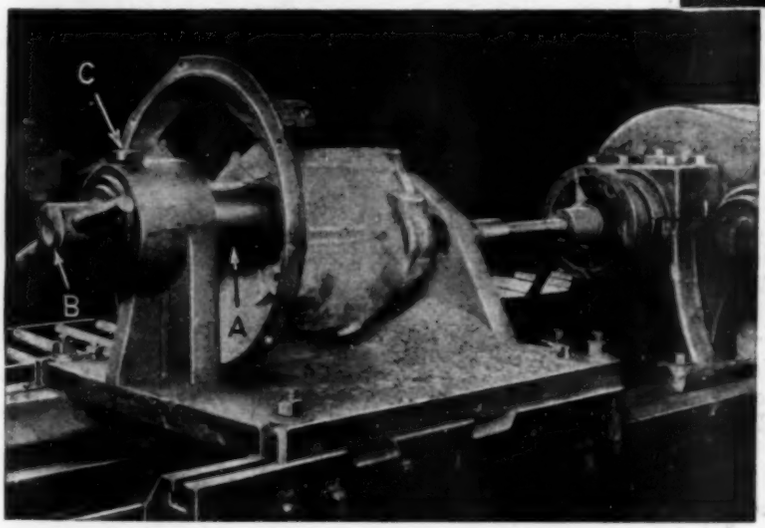


Fig. 9—Because both the countershaft holes and the reverse idler holes are on the same radius from the main bearing centers, they can be drilled at one setting in a fixture provided with means for indexing

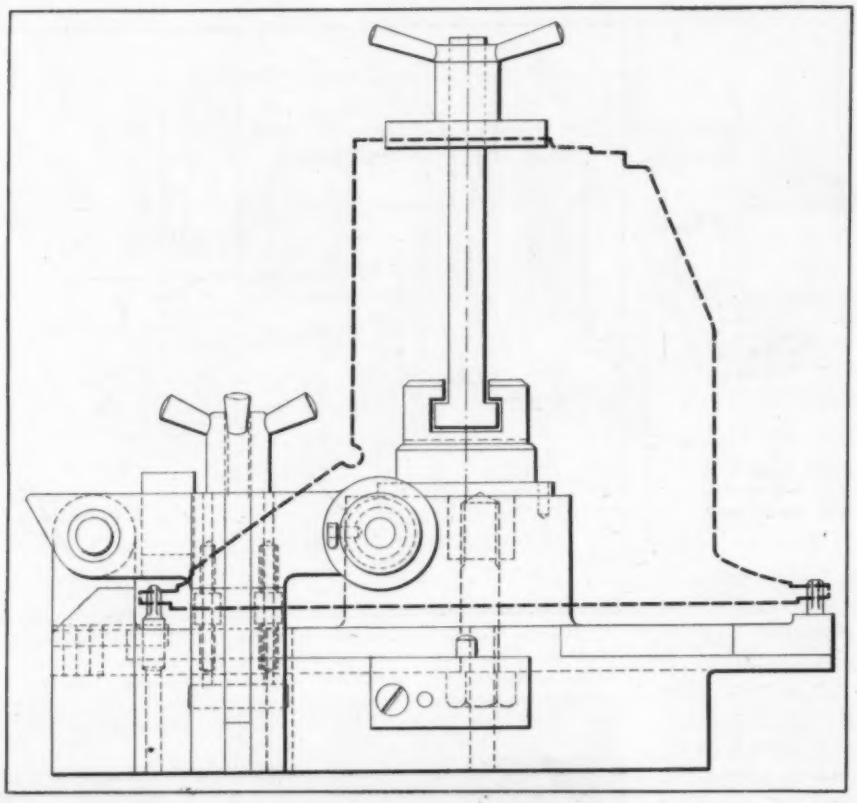


Fig. 10—In order to drill the clutch pedal shaft hole, the piece, with its axis vertical, is mounted in the fixture shown in the bed of a horizontal duplex drilling machine. The jig bushing arm can be swung aside for the spotting operation that follows

a bearing for the turret tool pilot. A special chuck is applied to the nose of the lathe spindle, and it carries a clamp bar *B* with swing bolt *C* to lock it in place against the inside face of the rear bearing. Drive of the piece is secured through this same clamp *B* which passes through the cover plate opening and bears against one side of the opening.

Ten holes, in the bell-mouth flange are drilled in the multiple-spindle drill shown in Fig. 8. The case is slipped over a vertical spindle and the previously faced flange rests on pins *A* and is clamped in position by the hinged plate *B* which bears against one face of the hand hole. This clamp is actuated from the front of the indexing table by crank *G* in conjunction with the latch *E*. Pins *F* engage bushings in the annular jig plate and assure its proper registration. One of these ten drilled holes is then reamed on a drill press and is used as a locating point in subsequent operations in which circumferential location is important.

In Fig. 9 is shown the mounting fixture used to hold the piece while the countershaft holes and the reverse idler holes are drilled in the case. The latter operation is pictured, although both are performed in the same set-up, both sets of holes being located on a 3½-in. radius from the center of the main bearings. As the photograph shows, the bed of the fixture is mounted directly on the carriage of a lathe which is rigged up with a fixture for holding an extended drill. The rear bearing is located on a stub arbor and the front bearing is located on the trunnion *A* which can be slid back to clear the flange when the piece is being loaded. Capstan *B* clamps the trunnion in place and the plug *C* is used for indexing between the two drilling positions.

These drilled holes next are reamed in a vertical drill press. The reverse idler holes and the front countershaft hole are reamed with a standard ⅞-in. reamer, and the rear countershaft hole is reamed slightly larger. In a similar set-up these holes are spot-faced on both sides with special tools. Drilling of the hole for the clutch shifter shaft, reaming it and spot-facing

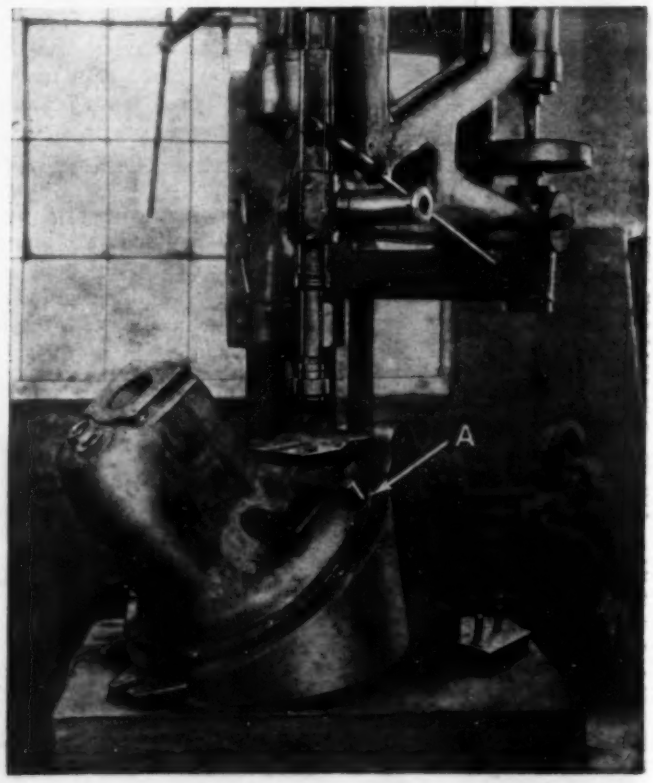


Fig. 11—In this set-up the two holes in the handhole cover seat are drilled and tapped using the hinged jig plate for the former operation. Pin A locates the piece through a reamed hole in the flange

the boss is all done in a Garvin duplex horizontal drill. Only one drill head is ordinarily used, however, the other being reserved for cases used on right-hand drive cars for export. The drill and ream bushings are carried in a pivoted arm that can be swung back out of the way when the spot-facing tool is used. Fig. 10 shows the design of the fixture, which is placed on the bed of the machine. As usual the piece is centered on the front bearing, but in this case means are used for clamping it through the rear bearing. A circular plate fits over the opening and a screw rod passing through has a T-shaped end engaging a T-slot in the front bearing locating block, so that clamping and unclamping is simple and rapid.

All the operations that follow, drilling, tapping, or reaming are performed in upright machines of various types. Figs. 11 to 15 show several of them. In Fig. 11 the two holes on the sides of the hand-hole are being

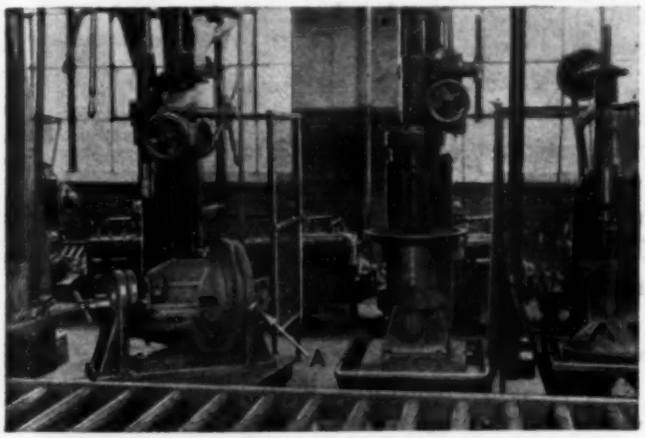


Fig. 13—A series of drilling operations. In the last unit the casting is supported in a cradle so that holes in two different angles can be drilled and tapped

drilled and tapped for ¼-in. capscrews. As can be seen the drill jig is in the form of a hinged plate, which can be swung up out of the way for the tapping operation. The two pivoted arms of the drill permit both holes to be reached while the casting is held in a fixed position on the fixture. For light work of this kind no clamping

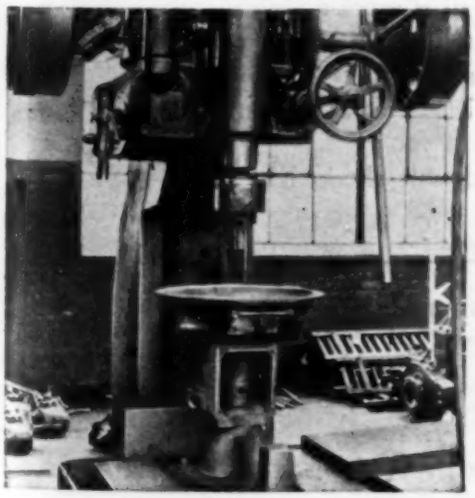


Fig. 14—In this heavy-duty drill the front bearing is reamed and faced. A similar operation is performed on the rear bearing with the casting inverted in position in another unit

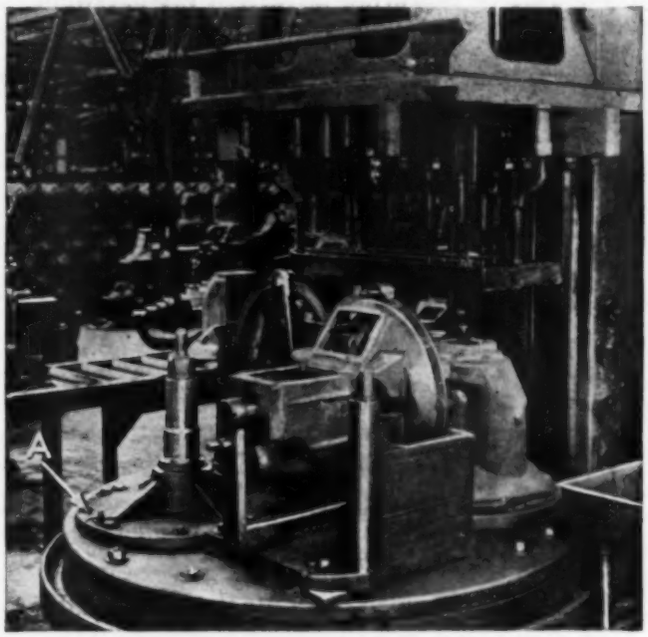


Fig. 12—The most effective use of the space on this indexing table and of the drilling time was found by combining two drilling operations while the cases were held on two sets of axes. The part is carried on the main bearing centers in both instances

is necessary, but the pin *A* is inserted through the reamed hole in the flang to prevent the casting from turning on the main bearing axis upon which it is mounted.

In the multiple-spindle drill shown in Fig. 12 the four holes in the corners of the coverplate opening are drilled as well as four holes of equal size in the rear main bearing face. As can be seen two pieces are mounted with axes horizontal and two with vertical axes, both locating on main bearing centers. A bar is swung up into position to support the horizontal locating spindle at its outboard end. Pin *A* is used to fix the casting in position radially.

Other operations that follow are: Drill the oil return hole in the front bearing at a 7-deg. angle; drill four holes in the front bearing face; and drill and tap the filler hole in the side, and the drain hole in the bottom. Fig. 13 shows the three drilling units employed for these operations. For drilling the oil plug holes, a cradle-type of fixture mounted on trunnions is used, and latch *A* is employed to locate the piece in either position.

From this point on, certain parts of the case are finished to secure the accuracy required. For example, the front and rear bearing holes are reamed and faced so as to hold the bore within 0.001 in. of size and the face 0.002 in. on runout. Fig. 14 shows the set-up. All the flange holes are also finish reamed, using a jig plate in conjunction with a portable air-driven reamer. The flange also receives a finishing cut and is then ground to come within the required limits. The countershaft must check correctly for parallelism with the main bearing center line. Except for washing, this completes the operations on the piece, which then goes to the transmission assembly benches.

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions given at the foot of the page have been prepared

THE · FOREMAN'S

Old Kinks and New Ideas

"HELLO, Al. I suppose you are all swelled up with knowledge since you attended the engineering society meetings, aren't you?"

"Not so you can notice it. I listened to ten interesting papers, and each had one good idea buried in it somewhere, but I can't seem to remember them. They got lost in the fog that surrounded them. If the good points of each paper could be combined and added to at each convention, it would mean a general advance. As it is, I got nothing that is of use to me just now, and when I do want one of those ideas I will have forgotten it."

"I gather that the trip did not pay for itself?"

"Sure it did. But I am disappointed at not bringing back something definite, like Williams did. He's full of ideas."

"I'll say he is. He made me look foolish this morning."

"Williams don't usually do that with us foremen. What happened?"

"It was like this. I have been trying out a new jig on some bellcranks. The holes in them are three-eighths in diameter by about two inches long, and they just wouldn't come straight. I kind of slopped over and told Williams the jig was a bum design and I was going to have it changed over so's to use a piloted reamer."

"What did he suggest? I'll bet he had an idea for you."

"He sure did. He said, 'Why not try a reamer with the end ground like an end mill, and see if the holes won't come straight'."

"Why, that's an old, old trick."

"Sure, it is. That's what made me feel so foolish. I have known that kink for twenty years at least, but I was not in a position to tell him so."

"That's the same thing I am blaming the convention for. There are hundreds of good kinks, but there is no way of cataloging and saving them. Every technical magazine has several in each issue, but they are scrapped with the paper itself. Williams sprung one on me this morning too."

"He must be feeling good. I'm glad I am not the only one. What did he hand you?"

"I had some punchings with an arm on them that was folded over on itself to make sufficient thickness for a screw thread. I had trouble with the metal breaking at the bend, and I wanted to specify O. H. steel, but Williams said, 'why not cut it off at the bend and spotweld another piece on to make the required thickness'."

"You mean, make the operations call for blank and spotweld, instead of blank, bend and flatten. Will it work?"

"Certainly it will. I'm on my way now to have the die changed."

"Say, Al, I wish I was as well informed as the super is, don't you?"

"Check and double check, Kingfish."

Admitting that many old kinks, and new ideas are valuable, what is the best method of perpetuating their use?

Contributed by J. A. Potter, Chief Draftsman, Singer Manufacturing Company, Bridgeport Factory.

Foremen are invited to discuss these questions vital to their work; of course the

ROUND · TABLE

DISCUSSION OF EARLIER TOPICS

Keeping Machines on the Job

MODERN maintenance methods follow along the line of Chinese medical practice wherein the doctor is paid for keeping the patient well and ceases to receive remuneration when he is sick. In certain plants like the Westinghouse Lamp Company, the maintenance men receive bonuses and other incentives for keeping machines in working order. For example, the men's names are posted in a prominent position with colored indicator lamps in line with them. A red lamp, which can be seen the length of the room, indicates that a machine or group of machines is down for a major repair that was not anticipated; a green lamp would indicate that all machines under that man's charge were in good working order.

In other words, the men are penalized, by the loss of bonus money, for failure to keep the machines running. If Williams paid Pete on that basis, it would change Pete's whole point of view and would force him to anticipate breakdowns which he now waits to happen. This would mean, of course, that Pete would have the say when a machine should be put out of commission. If Pete failed to make good, Williams wouldn't have to fire him; he would quit for lack of sufficient pay.

—H. P. LEONARD

*

Smoking During Working Hours

THE LOSS of the comforts of "Lady Nicotine" to shopmen during working hours has been the cause of much unrest and dissatisfaction. Many shop men resent the fact that smoking is denied them while the office men are permitted to indulge. It is a difficult matter to justify one side and not the other, as the conditions seem to be about the same. Yet there is a difference, intangible though it be.

Smoking is prohibited in the shop, as a rule, because the insurance company requires it. The risk of fire is too great, and higher premiums must be paid unless the rule is posted and observed. While some men consider themselves greatly imposed on when denied the right to smoke, there is another side to the question that deserves consideration. While every man believes he can smoke without setting the plant on fire, there is a risk that by some mischance fire will be caused and will destroy the plant. In a case of this kind there will be no work in the destroyed plant and someone has deprived himself and his fellow workmen of a job. It is a very serious business to jeopardize the job of a fellow being for a moment's gratification. Another thing: most men cannot smoke and keep their attention on their work, one or the other is always neglected. But any rules about this matter should include all, from the company president down to the newest apprentice boy.

The argument is advanced that a recess period should be provided for smoking. This sort of thing has it's good and bad points. A period of this kind would probably provide a means of relaxation to the men and might prove to be a stimulant to production. There would probably be an argument about whether these periods should be considered as a part of the day's work or as just so much time lost by the men and have to be made up by lengthening the time spent at the plant. Again, the approach of a smoking period would be the cause of much slowing down in production as the men awaited the signal. Also they would be slow to resume work after the recess was over. And everyone knows that enough time is lost already in slow starting and early quitting at morning, noon and night, without providing any more chances.

—L. O. BROWN, *Toolroom Foreman, Holcomb and Hoke Manufacturing Company*

*

Paying for Dependability

ONE who is outstanding in ability to do his work properly and without supervision is a potential foreman, and is very apt to have ideas to improve production methods. Such a man is to be encouraged with commendation and adequate remuneration. He is the type who keeps his machine clean and well oiled, and has a minimum of spoilage. He sets a good example for the other men, and he might be used as a shop instructor.

The worker who can go on with his job without the attention of the foreman is of particular value when things are rushed, or when there is trouble and the foreman is busy. Under such circumstances the average worker and his machine would be idle much of the time, waiting for the foreman, or he would spoil work by going ahead. The dependable worker is certainly a valuable man. He is a money earner for the company and a peace bringer to the foreman.

—H. I. HAZZARD, *Engineer.*

*

The Ethics of Making a Change

IT IS, in my opinion, very unwise to leave your position for a new one merely because you are offered more money. There are many things to consider, namely, the future prospects and permanency of the new position, its location, the firm's general attitude toward its help, and above all, the question of ethics involved in your loyalty to your present firm.

It is presumed that the firm has been treating you fairly, which is why you are there, and the firm expects in return more than the mere rendering of a week's work for a week's pay.

When you assume the responsibilities of a new posi-

discussion is not limited to foremen. Letters accepted and published will be paid for

tion, you must first of all prove your worth, that is, "make good." You must cultivate the acquaintance of a new circle of friends, both in the shop or office, and in your new community. You must re-establish your credit and integrity among business concerns, and you must sever your connections with local churches, schools, fraternities and clubs. In general you must start all social and business activities anew. The prestige built up in social and business circles is canceled, or partly so, and if you own your own home, this may also have to be given up if the new position is out of town.

Above all these considerations arises the greater one of the value of loyalty, upon which no definite price can be placed. Without loyalty, armies could not be successful, friendships could not be maintained, firms could not long exist nor could any worth-while project be carried out successfully without this priceless asset. I believe that right-minded employers will appreciate this asset and reward it if it comes to their attention. Even though the salary in the old job may temporarily be less, the prestige of loyal employees who stick, will be greater than it would be with the new firm. After all, the new firm will be justified in thinking that if they can induce you to leave your old position, another firm likewise could induce you to leave the newer position. In short, your loyalty would be below par. —EMILE H. DION.

*

Who Shall Be Laid Off First?

WHAT constitutes a first class man, or as we have it, a high priced man? Just this: he is better skilled in his particular line; he can turn out a better class of work; he is quick and accurate; his percentage of spoiled work is low, and the length of time he takes to do a job is short compared to his fellows. Or else, he has been a long time with the shop and has become invaluable in some line peculiar to that shop. The very fact that a man has been a long time in a shop ought to be evidence of his value, or he would not have been retained so long or advanced to the standing of a high priced man.

The lower priced men are comparable to the high priced men according to their ability and alertness, and their value in fitting into the organization. It is an economic fact that there are more lower class men than there are high class men. Ed is right when he says the good men can get a job easily, but he'll find that the good man does not leave his job so readily, and when work picks up he'll find out that good men are not so easily secured. You may cut your payroll by laying off the better class men, but you will not cut the cost of the work you have on hand. A first class man is capable of doing a high class job, and he can also do the kind of work a lower grade man can do, and many times, he can do it more efficiently. That's probably why he is a high priced man. —HAROLD LAMB, *Master Mechanic, Hookless Fastener Company.*

IT IS unfortunate for any wage earner to be laid off, but every conscientious superintendent must first of all have some men who can do any job, not men that can do only some jobs. When the staff is cut down, this is particularly true.

Should one venture on such a scheme as letting the good men out for a short time, I feel sure that these same men would be difficult to get hold of again when the work picked up. The less skilled workman can be picked up much more readily.

I think most superintendents will agree that a house-cleaning now and then is essential in most organizations, and when could a better time be chosen than when work is slack? The workers themselves understand the condition of work in the shop and do not resent being let out under such circumstances. As regards first class men not agreeing to do third class jobs, I have never found this to be the case when work is slack, which is the only time they would be put on such work. Good craftsmen invariably do good work and this reflects back on the organization as a whole, so let's retain them.

—W. J. ELVIN.

* * * *

THE · NEXT · TOPIC

"Foremen and the Wage Bonus."

Who Shall Be Laid Off First?

SUMMARY OF THE DISCUSSION

Work was somewhat slack, and the advisability of laying off some of the men was being discussed. Ed stated that he expected to lay off some of his more highly paid men because they could better afford it and could also secure another job more easily than the others. Al combatted this theory, contending that the higher paid, expert men were the backbone of the enterprise and must be retained at whatever cost.

THE discussion on this subject was general. Many more letters were received than could be published. Almost unanimously, the opinions expressed were against laying off the higher priced, expert workman. It was held to be economic suicide. In a majority of the letters, the sentiment was averse to reducing the working hours so that no one would be laid off. This was held to be unfair to the good man, and economically unsound.

One or two correspondents were in favor of taking seniority into consideration regardless of the skill of the men involved.

The reasons given for retaining the good men were threefold. Good men are difficult to secure and should be kept when one is fortunate enough to have them. While it is true that they can secure employment more easily than unskilled men, they would be reluctant to quit a new job and return to the one that had failed them.

It was further contended that a force could be built up rapidly with high grade men as a nucleus, but not with mediocre men. The third, and most convincing reason for the retention of good men was that, while an expert mechanic can do either quality or routine work, the inexpert man is limited to routine work alone.

Fig. 1—A view of the shop of the Thurner Heat Treating Company

A Heat-Treating Job Shop

Organized Along Modern Lines

By Frank J. Oliver, Jr.
Western Editor, American Machinist

Automatic furnace control is featured on equipment, most of which has been built to specification — Metallurgical testing laboratory broadens service

AN EXAMPLE of a small but well equipped job heat-treating plant is that of the Thurner Heat Treating Company, of Milwaukee. It illustrates how effectively a limited amount of equipment and personnel can be organized to do work in accordance with accepted procedure. The Thurner company, which is now in its sixteenth year, moved to its present location in 1920. Since that time the number of furnaces have been trebled and the gross turnover quadrupled.

This healthy growth is attributable to several basic policies of the management: (1) purchase of modern equipment, even to the extent of having the equipment built to order at extra cost where the desired design is not available; (2) use of automatic temperature control wherever possible; (3) use of modern scientific methods; (4) installation of complete metallurgical laboratory facilities for check on results and for additional service to customers; (5) maintenance of a small staff of experts to supervise operations; (6) adoption of a broad policy of co-operation with customers, through a competent consulting staff; and (7) furnishing service at lower cost than most of the customers can attain in their own works.

This last premise is possible because most economic use is made of fuel and equipment, since the furnaces are nearly always up to heat. One customer, for example, finds it economical to hire the use of certain furnaces and operators at a basic hourly rate, the work being done under the supervision of its own men. The customer pays only for the actual time he uses the furnaces, which is two or three days a week, whereas interest charges on idle equipment in his own plant would make the job too expensive.

Although some of the firm's customers are located in distant states, about 80 to 85 per cent of the business is local, coming from approximately three hundred plants in and around Milwaukee. The plant is located strategically in a central portion of the city, and all but the heaviest parts are handled in the company's trucks, of which there are two.

Gas and electricity are the fuels employed because of the ease with which they lend themselves to accurate furnace temperature control. Gas is favored because of

penalties on the use of electricity during peak hours in the winter months. These peak hours run between 4:30 and 7 p.m., from October to March, and if the electric furnaces are operated during this time, the full household rate per kilowatt-hour is charged for the entire day instead of the wholesale rate, which is about 20 per cent of the former. Hence it is highly necessary to plan the work so as to avoid these hours, but in most cases the gas-fired furnaces will take care of the requirements at the end of the day.

According to the company's experience the maintenance of the gas furnaces is much less costly than that of the electric furnaces, owing to frequent replacements of heating elements and metal hearths, and to constant supervision of contact points. Automatic control is favored in either case, because it completely eliminates the human element in control, and the increased reliability of operation more than offsets the cost of installation of the necessary equipment.

As with most small job shops, several executive duties must be placed on the shoulders of a few men. In this case the president is the general manager and the treasurer. The secretary of the company is also the shop superintendent. A practical metallurgist acts as contact man, being a consultant chiefly, but also functioning as a salesman. The laboratory is in charge of a metallurgist and chemical engineer. Besides the superintendent, there are twelve men in the shop, including three on the night shift. One of the day men specializes on tool hardening and die work; the others work at the various furnace units. Two of these men are truck drivers; both work in the shop when they are not out delivering work. One truck is on the road 80 per cent of the time, the other less often. About half of the number of customers truck their own work to the shop.

Secretarial work is handled by a young woman who also takes the telephone calls and receives visitors at the door. In addition she keeps the books of account under the supervision of a local firm of commercial accountants.

Two shifts are used in the shop. The day men work 10 hours for 5½ days, commencing at 7 a.m., and the night men 13½ hours for five nights a week. On account of the nature of the business, only straight hourly wages are paid. Although the volume of business fluctuates, men have been laid off only twice in the past sixteen years. When orders are low, the men are kept busy repairing, painting, and cleaning up.

Most orders are obtained on an estimate basis. The estimates are based on the size, shape, weight, type of steel, quantity, and hardness specifications. Laboratory charges are a fixed rate for an analysis, as determined by experience.

It is usual for the customer to supply the analysis of the steel and to state the required physical properties, leaving the details of heat-treatment to the Thurner specialists. For S.A.E. steels, of course, standard procedure is employed.

As mentioned previously, a practical metallurgist acts as contact man, and in that capacity he is consultant and salesman. Most customers are obtained through follow-up of inquiries, the inquiring company usually having received the suggestion from a customer of the Thurner company. Little so-called missionary work is done, and most calls are made upon old customers who suggest where other business might be obtained. Few concerns will guarantee heat-treating work, but this company will, provided it can specify the material to be used.

In Fig. 1 is shown a general view of the shop, and in Fig. 2 a floor plan giving the equipment layout. In the photograph can be seen two of the large gas-fired furnaces at the right, the quench pits in the floor, some of the electric furnaces, and the instrument control board. The shop measures 50x102 ft. overall, and is built of brick with structural steel roof trusses. The roof itself is made of hollow tile for insulation purposes and has a double row of ventilating windows near the peak. A powerful fan mounted in the roof takes care of the exhaust gases. In the floor plan, the front of the building, which faces on the street, is shown at the right. To the left of the entrance is the office of the president and manager, and immediately to the right sits the versatile

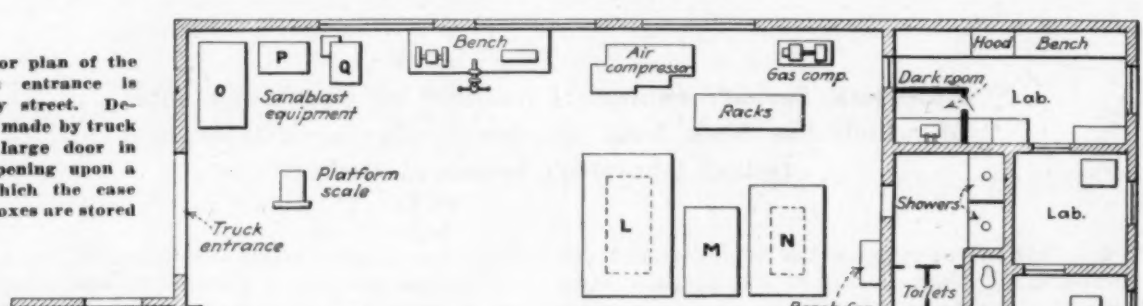


Fig. 2—Floor plan of the shop. The entrance is upon a city street. Deliveries are made by truck through a large door in the rear, opening upon a yard, in which the case hardening boxes are stored

A—Lead or salt bath
B—Quench tank
C—Turbo-blower for gas furnaces
D—Portable quench tank
E—Gas-fired furnaces
F—Gas-fired salt bath
G—"Cigar lighter"
H—"Hevi-Duty" electric furnaces
I—Special gas-fired furnace
J—Electric pot-type furnaces
K—Quench tanks, one oil, one water
L—Surface Combustion furnace
M—Oil Quench tank
N—Home-made gas furnace
O—Dust arrester
P—Cabinet-type sandblaster
Q—Barrel-type sandblaster
R—Deep lead drawing pot
S—Cyanide or lead pots
T—Quench tank
V—Bin for carburizing compound

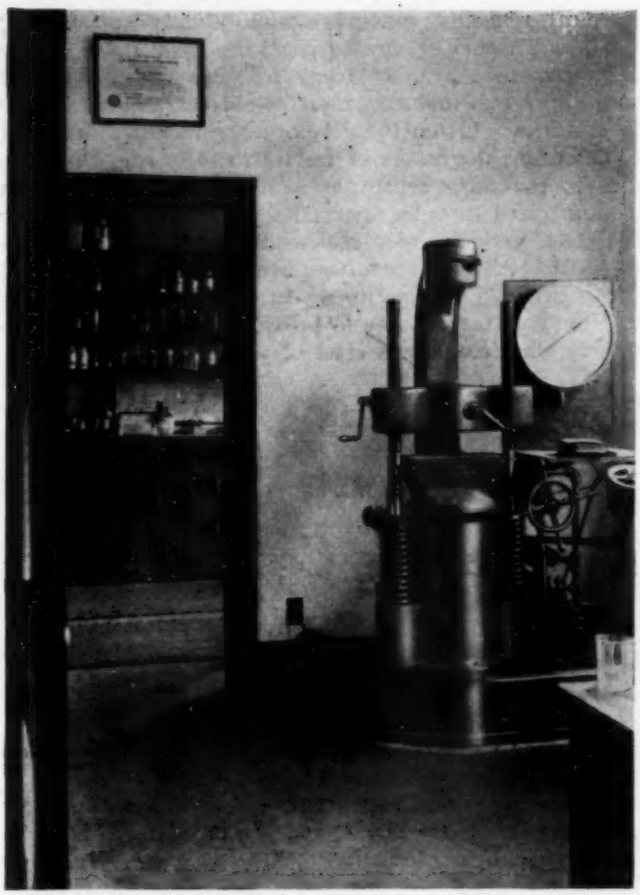


Fig. 3—Tensile testing machine located in a small room just off the chemical laboratory which can be seen through the door

young lady who receives the visitors, answers the telephone, writes the letters and keeps the books. In this hallway there is also a desk for occasional use of the shop order clerk, who is also one of the furnace operators. Further to the right is the small room in which the testing machine is kept, and beyond that is the chemical laboratory. The northeast corner of the shop, just behind the manager's office, is reserved for the heat-treatment of small tools and parts. In this corner is also located a bench with a small hand straightening machine and vise. There is also a small gas jet and plate, known as a "cigar lighter," used mainly for selective drawing of heat-treated parts.

The instrument board contains the temperature recording and control apparatus. For measuring the temperatures of the small furnaces and salt baths there is a Wilson-Maeulen electric pyrometer of the non-recording type. In conjunction with the instrument is a multiple point switch for throwing in, one at a time, the various thermocouples permanently located in the furnaces. For the salt baths, however, portable thermocouples are employed. Other instruments on the panel are three Leeds & Northrup recording and controlling pyrometers; a non-recording, but controlling, Wilson-Maeulen pyrometer; a Brown recording controller; and an Englehard recording pyrometer. All except the last named can be applied to the control of any of the furnaces in the shop excepting the small tool units and the cyanide pots in the south room. Since the control for both the gas and electric furnaces works on the three-wire principle, that is, with a high and a low wire on either side of a neutral, it is possible to shift the recording control apparatus from one furnace to another merely by changing leads on the instrument panel.

There are two instruments that can be used with the electric furnaces only. These are automatic time clocks that can be set to shut off annealing ovens on a Sunday, for instance, or to start up the furnaces early Monday morning before the men come to work.

The special gas furnace *I* is the company's own design and was built at a time when no such similar equipment was available. It is both under- and over-fired and has a carborundum hearth, because it was found that this material transmits the heat more rapidly than the conventional fire brick. The two sets of burners are independent and automatically controlled. With both sets in operation a temperature between 2,300 and 2,500 deg. F. can be maintained for high-speed steel treatments. A set of atmospheric burners is used in the same furnace for drawing operations. Heavy insulation, 7½ in. thick, is used in both the door and side walls, and for the further heat economy the door is tight fitting.

In like manner, the largest furnace in the shop and the one occupying the central position *L* in the floor plan is special. It is a modified Surface Combustion oven type with a hearth measuring 44x108 in., constructed so that it accomplishes the work of two furnaces, resulting in the saving of additional investment in equipment and also of needed floor space. The furnace has two ranges of heat, one for high temperature work, the other for drawing operations. Three separate sets of burners are installed. One set is used to force the heat up quickly to start the furnace, another set is for holding the heat, and the last and smallest set is for drawing temperatures between 700 and 1,000 deg. F. The second set of burners is graduated in size, the larger ones being near the door, each separately controlled. Another feature is that venting of the exhaust gases is done through the top of the door to avoid cool spots in the furnace vestibules. This furnace is also provided with extra-heavy insulation to reduce heat losses. In conjunction with it is a Lambert & Mann gas compressor.

In front of the large furnace two 800-gal. quench tanks are located in the floor. Each measures 3x5 ft. in section and 9 ft. deep. One is used for water, the other for oil, the oil being circulated over water-cooled pipes by a pump.

In the cyanide room, a Hoskins recording pyrometer is mounted on the wall, and a 5-point switch permits connection of the instrument to any one of the five pots. An overhead hand bridge crane serves the pots, a perforated metal ladle being suspended therefrom and handled through a pair of long tongs. There is also an overhead crane in the main shop near the rear door for lifting material off the trucks, which are driven directly into the shop.

Altogether there are 21 furnaces, 14 of which have been added since the company moved into this plant in 1924. Practically all of the equipment installed at that time was new. At present the company has an order for a new-type drawing furnace capable of developing any temperature between 200 and 1,000 deg. F. It will be gas-fired, and by means of convection currents will heat the work directly by dry gas instead of by salt. It is a rotary basket type with automatic unloading, and like the other furnaces in the shop, will be automatically controlled.

In the laboratory, which is divided into two parts, are

facilities for testing metals in tension or compression and for making chemical analyses of steels, iron, fuel, and lubricating oils. The testing equipment, Fig. 3, is a 60,000-lb. Southwark-Emery hydraulic machine, capable of developing a stress of 300,000 lb. per sq.in. on a standard test specimen 0.505 in. in diameter. For steel analysis, there is a small bench drill press for turnings, a small bench electric muffle furnace, and an electrically heated oxygen tube furnace for carbon combustion. In addition there is a microphotographic camera mounted vertically, and a darkroom. For the oil testing work there is a gas-heater hot plate and hood. Two sensitive laboratory balances complete the equipment, except for the chemical reagents, glassware and other paraphernalia.

The laboratory services give to the small plant, facilities heretofore available only to large companies that could afford to maintain their own research and testing laboratories. Often these laboratory facilities are used to determine the causes of failures, and to suggest remedies to minimize repetition. Other times it has been demonstrated that the material supplied the customer by the steel company was not within specification. Government work requires a complete record of the physical properties of a test specimen sent through with the work, and the company is able to provide this service for customers who handle this class of work.

Japan Has Set a Precedent for the Next World Engineering Congress

By Fred H. Colvin
Editor, American Machinist

NOW THAT the last post-congress excursion of the World Engineering Congress is over and the delegates and members from twenty-six nations are on their way across the seven seas to their respective countries, it behooves the engineering societies of the United States to consider the work that lies before them in preparing for the next Congress. For, while it is not definitely settled, there seems to be a strong feeling that it should and will be held in Chicago in 1933.

Only those who have been responsible for planning and carrying out the details of a large convention can appreciate the months of effort that lay behind the Congress that has just closed. To meet delegates from all over the world, to secure proper local transportation and hotel accommodations, to look after baggage, the innumerable trunks, bags, boxes, and bundles, and to deliver them to the proper persons at the right hotels, to calm excited individuals who do not understand the language, and to maintain harmony, are no easy tasks. Our task has been made harder because of the comparisons that will inevitably be made with the way in which details were handled at Tokyo. Our Japanese hosts set such a high standard of tact and efficiency that we must enlist the support of our best planners and organizers as early as possible if we hope to equal their hospitality.

One great advantage of the Japanese central committee was that the government railways could, and did, issue passes to delegates, members, and their wives over all the railways in Japan, leaving only excess fares and sleeper charges to be paid by the individual. The best we can do will be to secure the special rates granted where the numbers are entitled to such a reduction. It will likewise be difficult to equal the uniform courtesy that was always in evidence whenever a W.E.C. badge was seen. Fortunately, we can offer first class rail accommodations over a variety of routes that will give some idea of the natural beauties of the country. We cannot, however, hope to provide a similar number of scenic trips radiating from Chicago, or any other city east of the Mississippi that can compare with those to Miyanoshita, Nikko, or Kyoto; nor can we show much of historical interest to natives of countries whose history and traditions reach back hundreds of years.

Engineering development can, of course, provide almost unlimited interest and great variety, but the specific example of such should be very carefully selected. We do not want to impress foreign visitors solely with the magnitude of our plants; we must also show shops and factories of smaller size in which they can see methods that have more universal application to average-sized plants. Nor should the visits be confined solely to factories devoted to utilitarian products. For while we are justly proud of our progress in manufacturing which has resulted in a reduction of the cost of manufactured articles to the point where millions can now enjoy such comforts as mechanical transport, electric refrigeration, radio, and the like, we do not want to add to the strong, though erroneous, impression that we care nothing for the artistic side of life. We cannot show factories where a few men slowly fashion copper, silver, or gold and enamels into cloisonné, or painstakingly hammer fine gold wire or plate into intricate designs in damascene work. We, however, do produce many beautiful pieces of silverware, of woven fabrics and the like, and these should be carefully considered.

Our Japanese hosts were most considerate when it came to speechmaking; we can do well by following their example. Spellbinders who feel duty bound to orate interminably should be relegated to the background. Flag wavers who cannot refrain from enlarging on the greatness of the country have no place in such a program. And it might be well for visiting delegates to get together and select one or two men to represent them on different occasions instead of making it necessary for the hosts to exercise such extreme care in calling for responses from representatives of each nation in order to avoid slight or discrimination.

When and if we invite delegates to the next World's Engineering Congress in Chicago, let us be sure that we have planned details as carefully as possible, and that we have allowed adequate time to get all the committees and other agencies into good working order.

IDEAS FROM PRACTICAL MEN

The department, "IDEAS FROM PRACTICAL MEN," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

Concavities and Convexities

A Symposium on Concave, Convex, and Oval Machining

In three sections. The second will appear next week.

WHY two or more widely separated individuals should conceive of the same idea, and bring it to fruition at practically the same time, is a phenomenon that excites wonder in the mind of one who is interested in cause and effect.

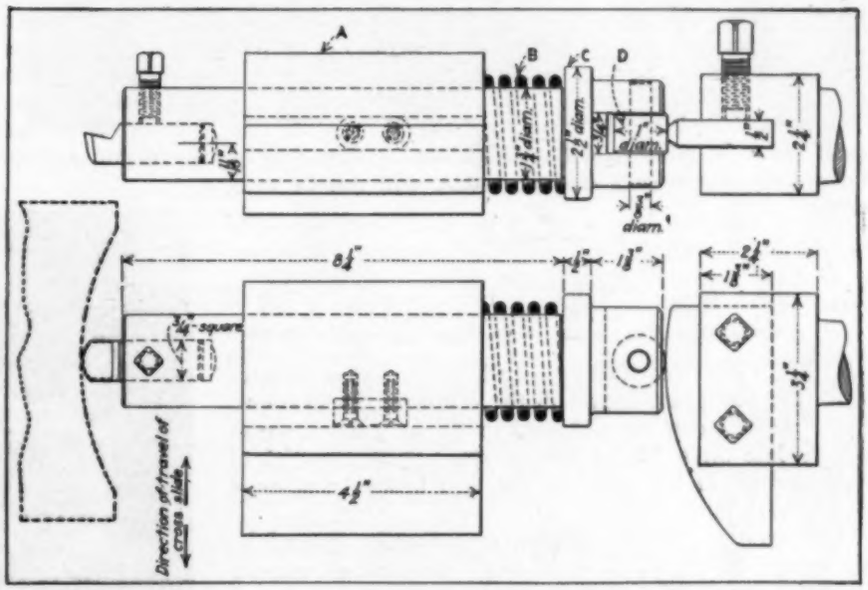
History is full of such incidents, as is science, and the arts. Darwin had his Wallace, Gray claimed precedence to Bell with the telephone, and three separate individuals rediscovered Mendel's law of heredity in 1920. The patent office has on file the record of many basic patents being applied for simulaneously, where neither individual knew of the other's existence. Such coincidences are not unexpected where there is a demand for a thing, or where there is an obvious need, but when even the idea itself is novel, it is almost uncanny.

This same urge is evident in technical literature. Some time ago, six contributors sent in methods of machining curved holes. Each method was original and different, and as far as can be learned there was no precedent to make the urge a contemporary one.

The same is almost true of this symposium on machining concave, convex, and oval shapes on the lathe and boring mill. One or two of them were suggested by a "practical letter" that was published, but most of them as far as can be judged were spontaneous. All of the methods presented are different, yet all of them are practical. Taken together they are an interesting study in mental processes. The analytical, the engineering, the practical, and the mechanical types are all represented, and for that reason they are being published together.

Turning and boring other than circular shapes is as old as the art itself. If memory serves, da Vinci invented a duplicating lathe in the sixteenth century. The old type of copying lathe that turned gun stocks is now being applied to industrial uses, and eventually we may place a model on one spindle of a lathe and reproduce it on another spindle, a perfectly feasible and obvious method.

Ball turning lathes and trepanning mills that cut oval manhole openings in boilers and tanks are standard equipment. It is not with these that these descriptions deal, but with temporary fixtures which transform a normally circular turning or boring machine into a two-dimensional machine that will machine convex and concave, or oval parts.



Method of generating a concave or convex surface by means of a cam held in the tailstock or turret. A heavy spring maintains contact with the cam

ANDREW W. BROWN
Glasgow, Scotland

A FIXTURE for turning concave and convex surfaces in a lathe is shown in the illustration above. It may be attached to either a standard lathe or a turret lathe with cross slide and carriage.

It was originally made for forming the concave head of small pistons, but has since proved very useful on other jobs of a similar type. A feature is that it can cut any form that does not change direction too abruptly. Different profiles may be formed by making forms for

the tail stock. In this, and the fact that it can turn a small concave or convex, it has an advantage over some other methods.

The fixture consists of a mild steel block *A*, shaped to fit the tool rest of the lathe. A hole is bored in this block to accommodate the sliding holder *C* which has a substantial feather key to prevent its turning under the pressure of the cut. This holder has a ¾-in. hole in a suitable place and at the proper angle to hold the cutting tool, and a collar near the other end to take the thrust of the spring *B*. This collar end is turned down and slotted for the 1-in. diameter hardened steel roller which follows the cam.

A flat cam, or form, of suitable shape is attached to the tail stock of the lathe, or held in the turret of the screw machine as the case may be.

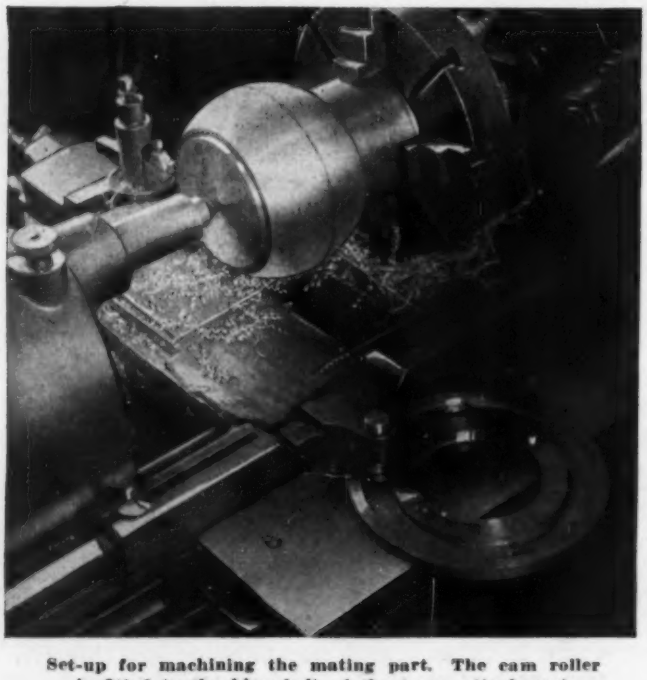
The operation is apparent from the illustrations. All that is necessary, is to keep the roller *D* against the forming cam, and to traverse the cross slide of the lathe toward the center. When taking more than one cut the tool must be fed in by moving the tail stock or screw machine carriage toward the job.

A point that should be watched is that the cutting tool must either be pointed or have a radius equal to that of the roller, otherwise a correct profile will not be generated.

MAX SCHWARZE,
Foreman, Milwaukee Shops,
Chicago, Milwaukee & St. Paul Railroad

A METHOD of turning a ball, and a socket connection for it, are shown in the following illustrations. This ball and cup joint is used in the articulated steam supply line on a Mallet locomotive. It is essential to turn and grind the ball and the two bronze cup rings to accurate dimensions.

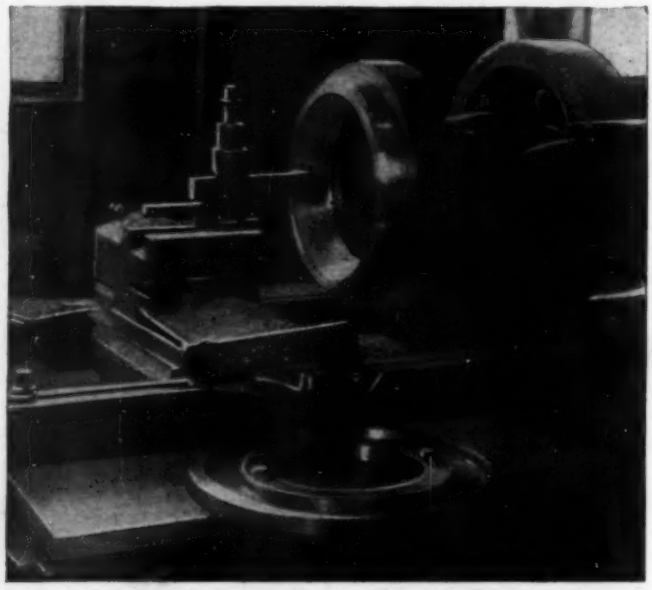
The accuracy of the turning operation is assured by the device shown, which in essence consists of an annular grooved plate bolted to the taper turning attachment of the lathe and engaging a roller on the pin in the cross-slide that is used with the taper turning attachment. Necessarily, the pitch diameter of the grooved plate must be the required diameter of the ball. In use, this grooved plate is bolted to a flat plate having a groove planed in the bottom, and this secondary plate is keyed and bolted to the taper attachment bar on the back of the lathe, as shown in both illustrations.



Set-up for machining the mating part. The cam roller is fitted to the king bolt of the taper attachment

The ball is cored with a cylindrical hole, which is bored to size. The ball is then placed on a mandrel, one end of which is chucked while the other is carried on center by the tailstock. In operation, the locking pin of the cross-feed slide is removed, and the pin which is used in the shoe of the taper attachment is slipped into the roller which contacts with the circular groove in the ball turning attachment. The exact center of the ball at a right angle to the mandrel is marked on the ball itself. The cutting tool, which is a pointed one, is brought up to it.

Next, the entire taper attachment assembly is shifted so that the center of the grooved plate corresponds with the center of the kingpin. This can be accomplished by putting a center punch mark on the plate at a point on its center line with regard to the taper turning attachment, and also a center punch mark in the king pin

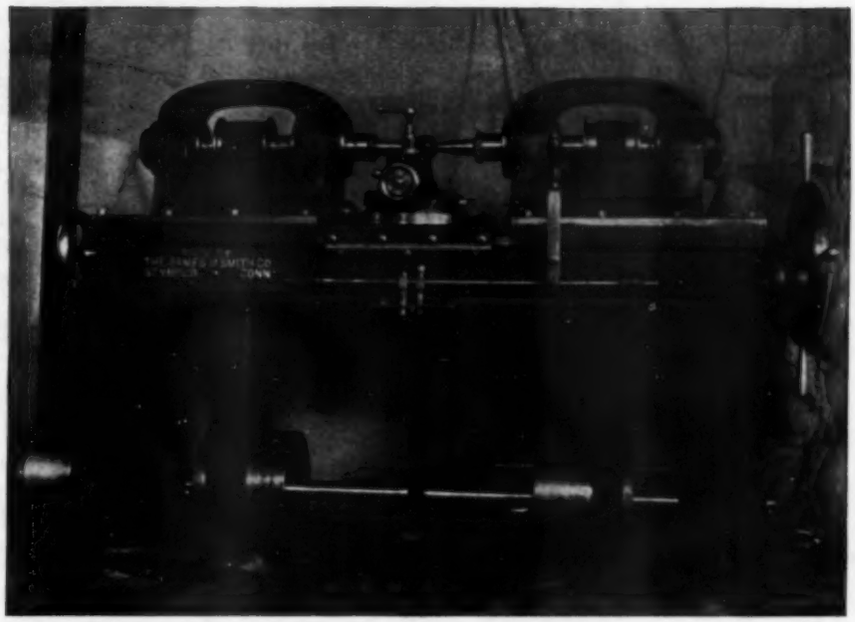


A ring cam for machining concaves. The mating parts may be machined accurately

holding the roller. It is then possible by using a pair of dividers and by shifting the taper attachment assembly to bring the plate in line with the king pin. It is necessary that the tool be placed on the corresponding center line of the ball, although not necessarily in line with the pin in order that a true ball be made. Care must be taken also to see that the cross-slide works freely and does not strike a dead end. The ball should be turned to size at the center line, allowing enough material, of course, for a finish cut. When the tool is down to the required size, a mark should be placed on the cross-slide as a guide, and the tool backed off and brought to the right-hand edge of the ball, and fed in until the guide marks on the cross slide coincide. The cut may then be started by using the longitudinal feed, repeating this until the desired diameter is obtained.

The machining of the socket ring is performed in the

same manner and with the use of the same guide plate on the taper attachment, as shown in Fig. 2. In the boring process it will be necessary to shift the taper attachment assembly to suit the length of boring tool used. Inasmuch as the ring forms only a segment of the circle, it will also be necessary to make templets to obtain the correct length of the chord and to assure that the boring tool is set to the exact center of the circle when the king pin is being lined up with the radius plate.



A standard convex-turning machine

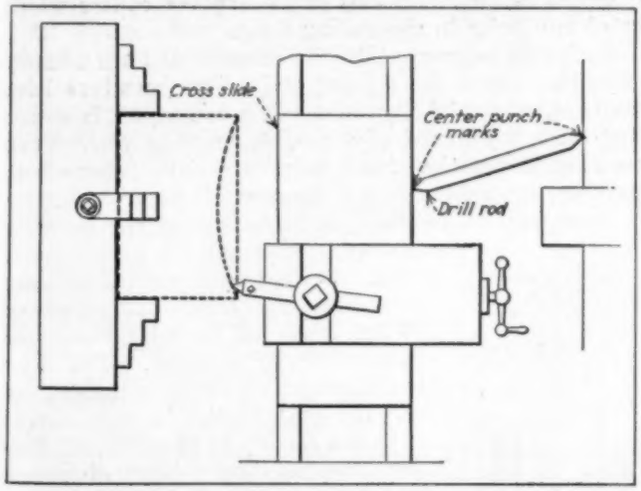
FRED PFUCHLER
Algoma, Wisconsin

THE SIMPLEST way is usually the best, especially where preparation time is an important factor. Having that in mind, here is the way I do concave and convex facing in a lathe.

Suppose the job to be one calling for a concave with a 10 in. radius. A piece of drill rod, or other steel, about $\frac{3}{4}$ in. in diameter, is cut the exact length of the desired radius and turned, or ground, to a point at each end.

With the compound rest of the lathe turned 90 deg., set the cutting tool at the exact center of the work. Make a deep center punch hole in the back side of the cross-slide and in the tailstock, opposite one another, so that when the pointed ends of the radius rod are placed in the center punch marks, the rod will be parallel with the lathe ways. If it is not parallel, move the cross-slide until it is, and reset the cutting tool central. It is not necessary that the radius rod be central.

Next, tighten down the tailstock, and hold the carriage tight against the radius rod by means of the hand wheel, and work the cross slide until the tool is in the position at which it will begin the cut.



Probably the simplest possible arrangement for facing a concave seat. In turning convex seats the rod is placed between the carriage and headstock

Start the lathe set the tool against the work by means of the compound feed handle. Throw in the feed for the cross slide. When the tool reaches the center of the work, throw out the cross feed, and with the carriage held tightly against the radius rod, bring the tool back for the second cut. Repeat this until the facing is finished.

For a convex facing, the radius rod is placed between the head stock and the carriage. For small radii a piece of steel may be clamped across the ways to hold the rod.

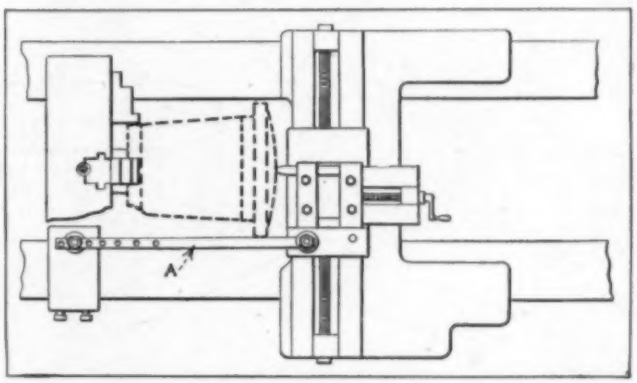
The advantages of this arrangement is that the lathe is not altered in any way, and the only accuracy necessary is in the simple rod. It is obvious that the depth of the prick punch does not affect the radius, in fact, a small drill may be used instead of a prick punch, provided the hole and the end of the radius rod are so proportioned that the rod can swing without slipping.

The individual radius rods act as gages, and insure accurate repetitions.

R. G. HEWITT
Yorkshire, England

THE METHOD I use for machining spherical surfaces in the lathe is quite simple, furthermore, it represents a minimum of equipment, and allows of duplication, either of the same, or mating forms.

In the arrangement shown, the only parts it is neces-



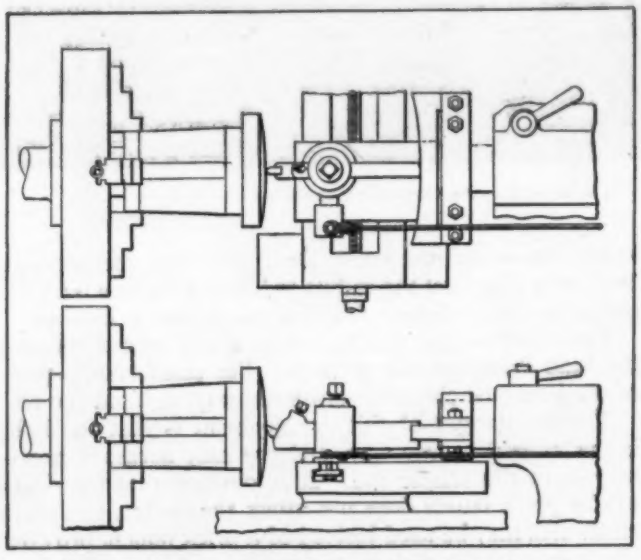
Using an adjustable bar fastened in either direction from the carriage. Pin holes at predetermined distances allow of duplicating a given part

sary to make are the rod *A*, and the bracket *B* which clamps to the ways of the lathe.

In machining convex surfaces it is essential that the distance between centers on the rod coincide with the radius of the spherical face to be produced. It is also important to see that the tool be set in the center of the work, and the radius rod should be parallel with the ways of the lathe.

When ready to use, the longitudinal feed gearing is disengaged, the cross feed is thrown in, and the cut started. Depth of cut is controlled by the compound rest.

By placing the bracket *B* on the tailstock side of the carriage, concave surfaces may be faced, and by drilling holes at suitable distances in the bar, either convex or concave surfaces of any radius may be machined.



Reproduced from a previous issue to illustrate still another method

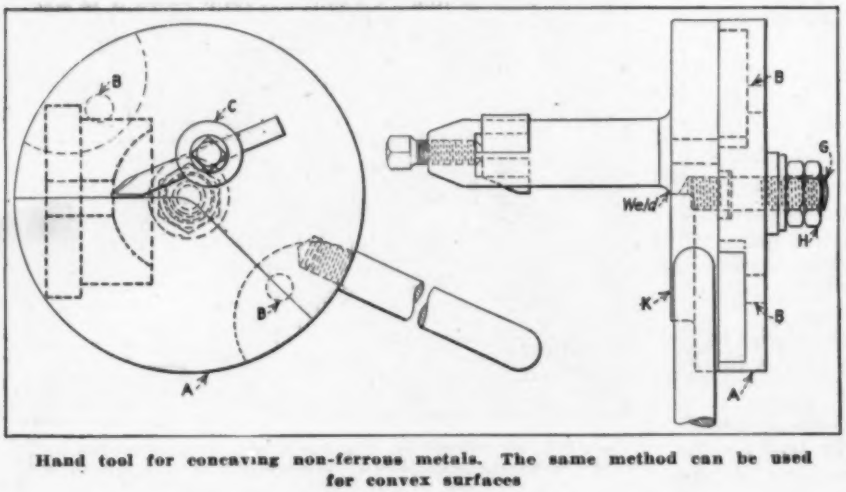
B. J. Stern
Engineer

AT TIMES it is necessary to turn a concave where the radius is so small that the ordinary means of maintaining a radius cannot be used. If the radius is very small, it can, of course, be roughed out, and then finished with a formed tool. Where the diameter is too great to allow of this, swivel motion of the tool may be resorted to.

Having to machine a ball seat in some brass castings, we designed the device shown in the illustration.

The base plate *A* is fastened by T-bolts through the holes *B* to the cross slide of the machine. These holes corresponding to the T-slots in the cross slide. On this base is located the swivel plate *K* to which is screwed the hardened stud *G*, located on the cross-slide so that it will line up with the central line of the lathe spindle. The stud *G* is a turning fit in plate *A* and holds this plate and the swivel plate *K* together by means of check nuts *H*, there being clearance in the cross slide for them. A tool post *C* is welded to plate *K* at the proper place to swivel, and the tool bit is clamped by a set screw in the usual way.

In operation the cross slide is brought against a stop so that the center of the turning plate *K* will correspond to the center of the ball seat to be finished. The swivel plate is then turned on its pivot *G* by means of the handle. A roughing and finishing cut are taken.



Hand tool for concaving non-ferrous metals. The same method can be used for convex surfaces

Spring Flexible Coupling—*Discussion*

By J. T. Towlson
London, England

I read with interest Malcolm T. Parkhurst's account of his adaption of the spring flexible coupling, on page 832, Vol. 71, of the *American Machinist*. Personally, and from experience, it is my opinion that the flexible coupling is in many cases a pandering to careless erection, or for erections that have got out of alignment. Whatever the cause of the misalignment it should be corrected.

In a factory with which I have been in close touch for years, flexible couplings were in common use on motor-generator sets, and speed reducing units up to 200 horsepower. These couplings were of the flanged type, with fixed pins in one-half that carried rubber collars which fitted into holes in the mating flange.

Such couplings are still quite common and are a handy expedient where the driving and driven members have been erected out of alignment. It is contended, however, that there is no need of a flexible coupling where good erecting is practiced, and more especially where both members are mounted on a common sub-base.

Assuming, of course, that each half of the coupling has been "trued up" on its respective shaft, the two units should be lined up so that four strips of paper, placed 90 deg. apart will be held between the flanges of the coupling. The holes in the flanges may then be line reamed and the pins fitted.

In the factory referred to, all flexible couplings have been discarded, and the driving and driven members are set in satisfactory alignment.

It is suggested that the best method of applying a spring coupling is to set the units as close together as their respective shafts will allow. The spring should encircle the shafts, held by a suitable collar at each end.

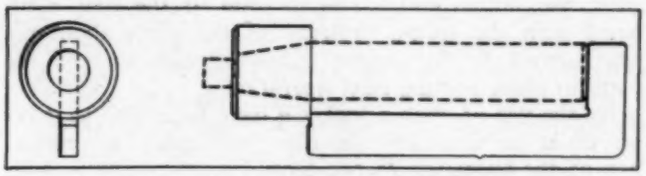
Such an arrangement makes a more compact assembly.

Gages for Checking Tapers

By Ernest Foldvary

An inexpensive and efficient method of checking tapers and their location on the shafts is by the gages shown in the illustration. The correctness of the angle of the taper is checked by the ring gage by coating the interior slightly with blue pigment and turning it around on the tapered part of the shaft. The blue spots rubbed off on the taper will show the accuracy of the angle.

The length gage is used for checking the location of



Gages for checking angle and location of tapers

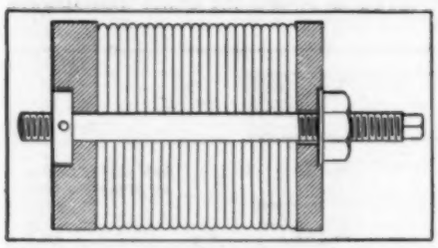
the tapered part, either from the end of the shaft, or from a shoulder. The plain end of the gage is stepped, one step being marked Go and the other Not Go, the difference between the steps representing the limit decided upon.

An Improvised Rubber Spring for the Drawing Press

By Charles H. Willey
Asst. Plant Supt.,
Hoyt Electrical Works

A very satisfactory and cheap rubber spring for the deep drawing press can be made from old inner tubes of automobile tires, obtained from garages for about three cents per pound.

The tubes are cut crosswise at the valves, then cut lengthwise and opened out. Disks, about 8 in. in diameter are cut from the flattened tubes by a



Rubber spring made from disks cut from inner tubes

simple cast-iron die. The central holes are cut by a dinking punch. The disks and the pressure plate are assembled on a threaded rod having a collar nut at the pressure-plate end and a large washer at the other end. The pressure plate is counterbored to admit the collar nut. The disks are compressed by tightening the nut at the washer end and the whole assembly, as shown in the illustration, is screwed to the bottom of the die.

We use such springs in drawing brass shells $\frac{1}{32}$ in. thick, $2\frac{1}{4}$ in. in diameter, and $2\frac{1}{2}$ in. deep, and find them very satisfactory. The edges are shown rounded to mark the different layers.

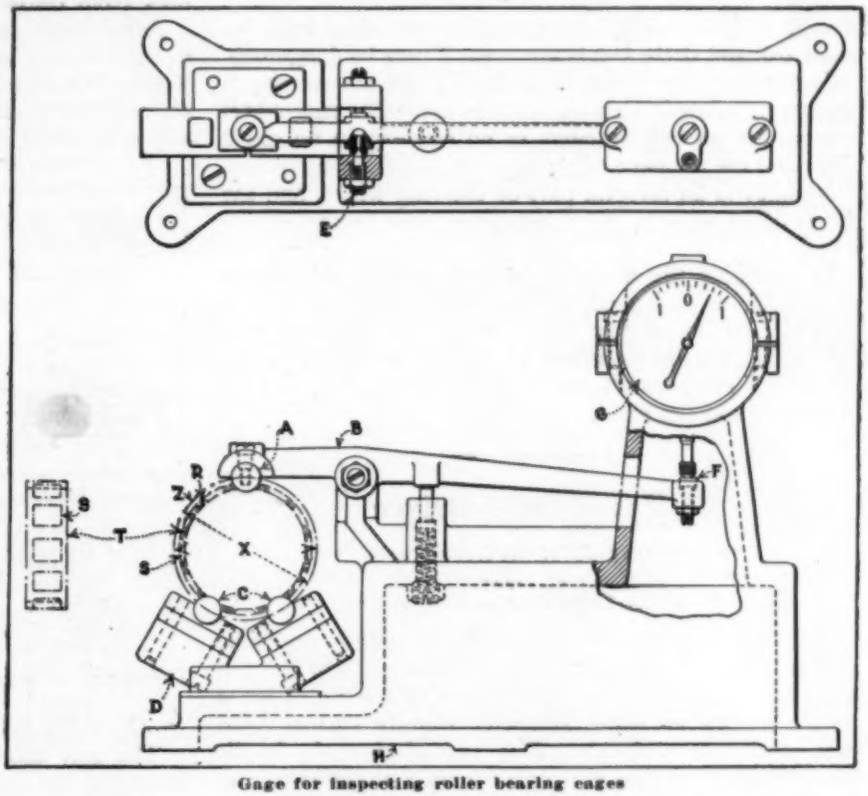
Indicating Gage for Roll Retainers

By H. J. Stern

The gage shown in the illustration is used for checking the radius of the formed windows, or openings *S* in the retainer cage *T* which is used in a roller bearing. This cage is made of steel tubing, and the openings are pierced and formed in a die, in conjunction with which this gage is used. As will be noted, the radius *R* of the openings are all struck from a common reference circle *Z;* this reference circle is very important, its diameter *X* being held to very close limits. Any deviation from this would be shown by the gage.

Three master rollers are used in this gage, one of which *A* is screwed to the lever *B* and the other two *C* being fastened to the block *D,* thus giving a three point bearing as shown in the sketch. The two rollers *C* are fixed and any changes during gaging will be taken up by the roller *A* which is fastened to the movable lever.

In gaging a retainer, the work is placed so that the three rollers fall into three openings in the cage. Any deviation from diameter of the reference circle will be taken up by arm *B,* which is pivoted on cone points at *E* as shown. This motion is transmitted to the hardened set block *F* on the other end of arm *B,* which affects the indicator dial *G.* This dial is set in the aluminum base casting *H* so as to be directly above the set block *F.* The ratio of movement of lever *B* is so figured as to compensate for the three point bearing of the measuring



Gage for inspecting roller bearing cages

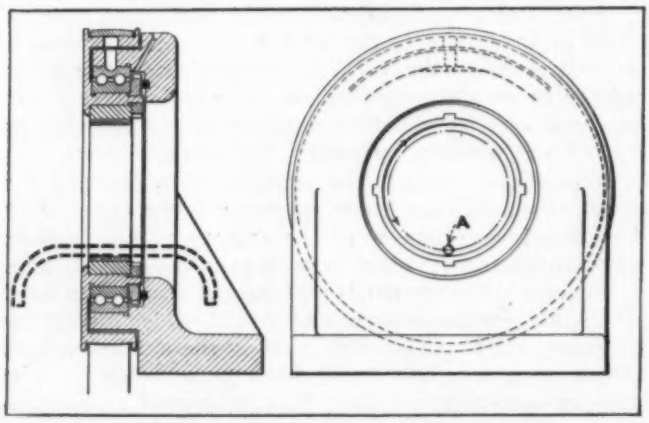
rollers, so that a difference of one thousandth of an inch in the diameter of the reference circle, will show as the same amount on the face of the dial *G*. In setting up the indicator gage a master retainer cage is used.

If, for any reason the spacing of the openings is not accurate, the gage will not function, as one or more of the master rollers will not enter. Thus it, also, acts as a spacing gage.

Device for Grinding Work That is Not Straight

By Carl G. Alt

The illustration shows a device adapted for grinding round work that is not straight, such as the handle bars for bicycles. In grinding such work on an ordinary grinding wheel, it must be revolved on its axis in order to have it touch the wheel at all points. If the work has



Device for grinding round work that is not straight

several bends, however slight, the operation becomes awkward, and if the bends are great it may be dangerous.

The device illustrated, in addition to its advantages in operation, is low in cost and safe in use. The ring wheel is mounted on ball bearings in an opening in an angle plate, and the abrasive material is on the inside, as shown. The pulley is an integral part of the ring wheel, and the rim is offset so as to lie in the same plane as that of the wheel.

In operation the work is inserted through the hole in the wheel, as indicated by the small circle *A*, and is rotated (not on its own axis) around the grinding surface in a direction contrary to that in which the wheel revolves. The opposite motions are indicated by arrows in the view at the right.

A Power Screwdriver

By Charles R. Whitehouse
Chief Timer,
Holtzer-Cabot Electric Company

Where a large quantity of round-head screws are to be driven, the tool shown in the illustration will do the work very rapidly. The tool consists of a piece of brass tubing having an inside diameter slightly smaller than that of the screw heads. One end of the tube is slit in eight places by four cuts of a hacksaw, the slots having

A frictional screwdriver

a length of about $\frac{3}{8}$ in. A piece of round, cold-rolled stock is driven into the other end of the tube to act as a shank.

In operation, the tool is held in the chuck of a high-speed bench drill. The parts with the screws started in them are held up to the tool so that the screw heads enter the slotted end. The rotation of the tool, combined with the spring pressure of the parts about the slots, drives in the screws tightly enough to hold the parts in place for the next operation.

By the use of such a tool, we have been able to drive screws at the rate of 60 per min., increasing the production of the operation 75 per cent.

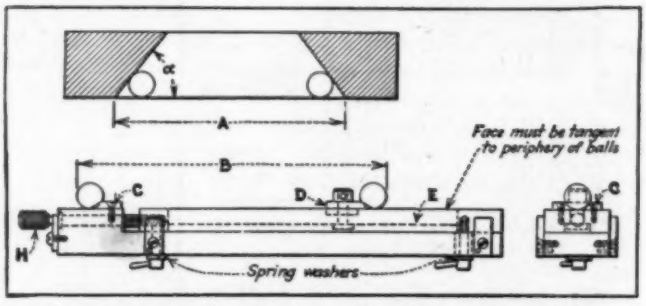
Device for Measuring Taper Holes

By Harry W. Clifford
Chief Inspector, Standard Gage Company

A very reliable and quite economical device for measuring the large diameters of taper holes in ring gages, dies, etc., is shown in the illustration. If properly made, it will check work within 0.0002 inch, which is well within the requirements of ordinary work.

Two standard steel balls of accurate dimensions, say 0.500 or 0.375 in., are soldered to brackets *C* and *D*., respectively, the former being stationary, while the latter is movable, being guided in a slot where it can be locked in position by means of a nut. Slide *E* is guided by two lugs on each side, as shown, and is locked by handled nuts from below.

After dimension *B* has been computed, the ball attached to the movable bracket is set within $\frac{1}{32}$ in. of the desired distance, and final adjustment is made with the adjusting screw *H*, as a micrometer, or size blocks with projecting end-jaws, being employed to obtain the exact dimensions.



Gage for measuring the large diameters of taper holes

It is obvious that the upper faces of the sliding parts must be even and straight in order to get accurate measurements.

The dimension over the balls is arrived at by the following simple calculation: $B = A - (\cot \frac{\alpha}{2} \times D - D)$, where D is the diameter of the balls.

The tool can be used for external measurements by reversing the brackets to which the balls are attached.

Nickel and Monel Metal

Forging Procedure

SUCCESSFUL forging of monel metal and pure nickel depends upon proper heating conditions, including maintenance of the right kind of atmosphere during heating, time of heating, and the temperature at which forging is done. If these conditions are right, these materials may be forged as readily as steel, and into as many shapes.

Monel metal must be forged at temperatures between 1,850 and 2,100 deg. F. The upper temperature limit for forging pure nickel is 2,200 deg. F., the lower limit being the same as that for Monel. Proper temperatures within these ranges for different types of work can be ascertained by experiment. In general, for simple swaging, drop-hammer, and die work, the metal should be heated to the upper limit. For bending operations, the lower limit gives better results. In the working range, the metals are at a bright yellow heat.

The time of heating nickel and Monel metal is that required to heat the piece uniformly through. For small rods, 20 minutes to a half hour is ample; for large rods and billets up to 6 in. in diameter, 40 minutes to an hour is sufficient. It is bad practice to hold either metal in the furnace after the proper heat has been attained, since this gives any sulphur in the flame an opportunity to react with the metal.

A balance between air supply and fuel to give a clear soft flame, slightly on the oxidizing side of neutral, is the proper furnace condition. This may be attained by first setting the fuel mixture so that there is a tendency to smoke, indicating an excess of fuel and a reducing atmosphere; then increasing the air supply slightly to clear the fire. This will give a soft flame, slightly oxidizing.

These essentials must be considered when a furnace is arranged for heating the metals. Care should be exercised that the fuel is mixed outside the heating chamber. If there is any danger of the unmixed heated air blasting against the metal, some sort of baffle must be introduced. Air should be supplied at low pressures to prevent impingement of the flame on the metal. Only by complete mixing and combustion of coal outside the heating chamber, can this fuel be used, largely because of its high sulphur content. The same requirement applies to producer gas. If these metals must be heated in a blacksmith's forge, a steel pipe of sufficiently large diameter, closed at one end, with the other end sticking out of the fire, thus creating a small muffle furnace, must be used.

Similar precautions must be observed with practically any fuel. Natural gas is the easiest fuel to handle. Artificial retort gas is also good, largely because of the ease with which the fuel may be thoroughly mixed. Oil, since it is available anywhere, is probably more generally used than any other fuel for this type of heating. Burners utilizing low-pressure air and mixing the fuel thoroughly are best.

Sulphur in fuel has a very destructive effect on these metals. Hot sulphur gases form nickel sulphide rapidly, with intergranular penetration, the nickel sulphide so formed having a melting point below the forging temperature of either of the metals. The sulphide melts in the metal grain boundaries and runs away, leaving the surface of the metal honeycombed, and causing it to look distinctly burned in appearance, in addition to being mechanically useless if the burning is severe.

Monel metal and nickel should not be forged or bent at a red heat; within the limits of the "red range" the ductility of these metals is reduced and they are distinctly "red short." The red-short range lies between 1,200 and 1,800 deg. F., the condition being at its worst at about 1,400 deg. F. In swaging, drop-forging, or die work it is often desirable to harden the finished piece by hammering it as it cools below the forging range. This is good practice, providing no severe deformation is attempted below 1,800 deg. F. Pieces may be hammered lightly or restruck in dies down to a black heat without injury. This will give a smooth finish to the oxide scale and will produce a harder and stronger forging.

Bending is difficult because of the tendency of these metals to rupture on the stretch side of the bend, or at any point put in tension in the red-short range. All bending must be done with a steady pressure and the work stopped when the metal temperature drops below 1,800.

Forging hammers and drop hammers are suitable for working the metals, but presses are not recommended. Heavier hammers are required for working the metals than are required for steel. The metals resist deformation and require great force to drive them into forging dies. Dies are usually made from carbon or nickel-chrome steel, hardened and tempered to 60 on the scleroscope. Die design should be such as to prevent too rapid chilling of the part where greatest deformation occurs. Trimming dies should be made of high-speed tool steel, should have considerable rake from the cutting edge, and should be set to cut tissue paper cleanly. Trimming may be done hot or cold. Lubricants used in trimming are usually mixtures of graphite and oil, about as thick as gear grease.

Courtesy of International Nickel Company, Incorporated

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American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

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Politics, Business, or Religion?

ONCE more the Russian situation is in the center of the picture. Even so, there is far more beneath the surface than is evident to the casual observer. As Whiting Williams pointed out last week, the Soviet authorities are pinning their faith on machinery—but machinery in the hands of men who do not know how to get the most out of it. If the five-year plan fails, what then?

Will politics, business, or religion direct the course of the rest of the world toward Russia?

Eight centuries ago religion would have ruled, and crusades against the spoilers of the churches would have cost the lives of many.

Eighty years ago politics would have pointed the way, and that way would have been immediately less bloody, but perhaps more deadly in the end.

And today? Will the business man who sees in Russia the greatest undeveloped market of the world dictate the policy? Will the politician who fears the rise of a mighty power sway public opinion? Or will the rising tide of resentment against the Soviet effort to divert religious fervor from church to state bring on another fanatical crusade?

The answer is not clear, but we who are building the machines on which Russia is depending have a big stake in the venture and must watch developments with care.

*

Two Hundred Thousand

WHETHER deeply significant or insignificant, certain groups of figures that have been released during recent weeks have a common merit in being surprising. The knowledge that during a period when all investors were supposed to be scurrying pellmell for margins and cover, the total number of stockholders in many of America's largest corporations increased to record heights may be welcome. Though lists of stockholders have been known to grow during previous depressions, these figures seem to indicate an unsuspected resiliency in the cash reserves of the investing public and should qualify as good and wholesome omens of the future. Future prosperity should at least be more widespread and thus more democratic.

General Motors has 198,000 stockholders where 117,000 constituted the roster before. The Woolworth Company has nearly doubled its stockholders. Packard Motor Car Corporation has 26,000 as against 11,000, more than double. With a high priced stock, the U. S. Steel Corporation gained 6,000 new stockholders.

The largest bank in the United States paid dividends to 50,000 on October 1, 1929; on January 1, 1930, it paid dividends to 62,500. In the six months, June, 1929 to December, 1929, another huge New York bank saw the number of its stockholders grow from 14,000 to 51,000, more than 250 per cent.

Doubtless, many a former stockholder is no longer numbered among the present holders; many a one, indeed, is an involuntary absentee. The fact remains that, even according to this abridged list, 200,000 investors had ready cash at the close of 1929, used it, and received 1930 dividends.

*

A Brake on Industry

IT WOULD be difficult to determine quantitatively the total effect that delay in tariff revision has on American and world business. The effect on any given business will probably be a more or less accurate reflection of the views of those in command. Free traders will steam ahead as far as they can go regardless, protectionists will wait for stabilization.

Whatever be the business philosophy of business men generally, all will welcome and applaud a settlement of the tariff question. Though the effect of the present unsettled situation can not be measured, and may be only psychological, it is none the less real. Whether through conciliatory breakfasts to recalcitrant Congressional leaders or through the precise administration of an unpadded big stick, it is to be hoped that President Hoover will succeed in achieving a prompt release of an unwarranted and unthinkable brake on industry throughout the United States.

SHOP EQUIPMENT NEWS

McKinney Type "B" Rolling Machine

ROLL forming of strip and sheet metal can be done rapidly on the Type "B" roller die forming machine announced by the McKinney Tool & Manufacturing Company, 1688 Arabella Road, Cleveland, Ohio. The machine is available in two sizes, known as the Nos. 1-B and 2-B, respectively. The first will roll up to 18 gage and the second up to 14 gage.

The base of the machine is a heavy box-type casting ribbed for stiffness, and the housings are semi-steel castings. The main housings are grooved to the bed and doweled in place to make practically a one-piece construction. The front housings are not bolted to the bed, but slide from front to rear on guide strips which are doweled to the bed. These housings are held at any desired point by bolts in T-slots. This construction permits each housing to be placed up against the work roll regardless of whether a wide or narrow section is being rolled. Spindle deflection is thus reduced to a minimum. Another feature is that the machine may be used as a standard two-housing machine for heavy work, and by pushing the front housings back until the ends of the work spindles are exposed, a strong and convenient outboard machine for light work is produced.

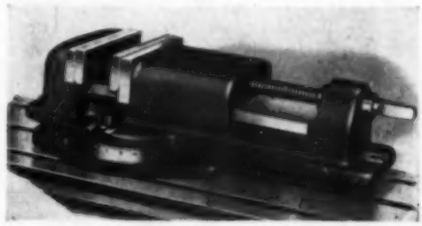
All gears employed are of steel and run in oil. Bronze bearings are standard equipment, although Timken roller bearings are furnished extra. The work spindles are of chrome-nickel steel, hardened and ground.

Starting and stopping of the machine is effected by a built-in friction clutch, the lever of which is located at a point convenient to reach from any point at the front of the machine. The motor is mounted under the bed where it is fully protected. Two speeds in the gearbox can be furnished at additional cost. This is of value where sections of various sizes are to be rolled. Where it is advantageous to roll sections from coil stock and cut them to exact length after rolling, a simple high speed cut-off saw can be provided.

Specifications for the No. 1-B machine: number of work spindles, 2 to 14; diameter of work spindles, 1¾ in.; widest sheet rolled, 10 in.; distance between stands, 8 in.; speed, ft. per min., 100 to 200; and capacity, 18 gage. Specifications of the No. 2-B machine: number of work spindles, 2 to 12; diameter of work spindles, 2¼ in.; widest sheet rolled, 14 in.; distance between stands, 16 in.; speed, ft. per min., 75 to 150, and capacity, 14 gage. These capacities are approximate only. The kind of material, temper, width of section, number of angles, and sharpness of radii, are governing factors.

Cincinnati Plain and Swivel Vises

Increased strength and rigidity are claimed for the vises announced by the Cincinnati Milling Machine Company, Cincinnati, Ohio. The fixed



Cincinnati Swivel Vise, which is particularly adapted to milling machines

1

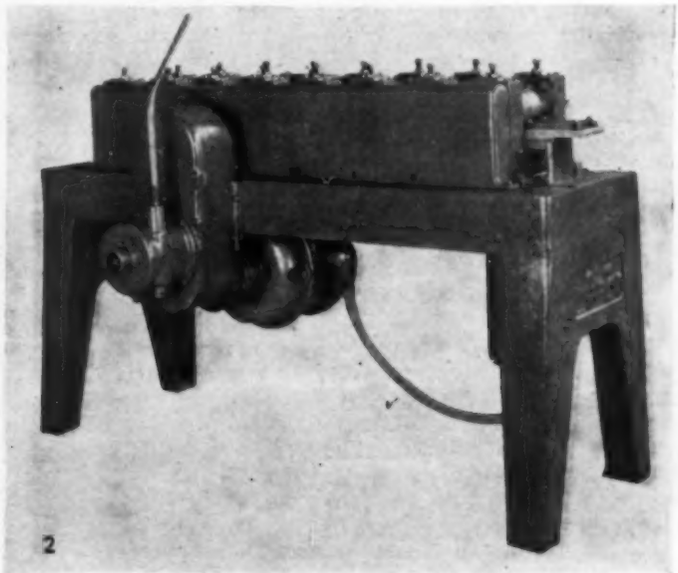


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Fig. 1—Front view of the McKinney Type "B" Roller Die Forming Machine, showing that the housings can be moved crosswise on the guide strip close up to the work rolls and prevent spindle deflection. Fig. 2—The motor and clutch are mounted at the bottom and the back of the machine, and a convenient clutch lever extends to the front of the machine

jaw section of these vises and the abutment, which forms the support for the screw that moves the movable jaw or slide, has been materially enlarged. The jaws are made of hardened and ground steel and are held securely to the vise body and slide.

The bottom of the plain vise is finished so as to enable it to be converted into a swivel vise by assembling to a swivel base graduated in degrees. The No. 3 plain and swivel vises have jaws 6⅛ in. wide by 1⅝ in. deep with a 4-in. opening, while the No. 5 vise in both styles has jaws 8⅛ in. wide by 2½ in. deep and with a 7-in. opening. These vises form part of the regular equipment of the milling machines manufactured by the above company, a swivel vise on the universal machine and a plain vise on the plain and vertical machines.

Reed-Prentice 14- and 16-Inch, High-Speed, Sliding-Gear-Head, Production Lathes

ADAPTED for plain turning, boring, and facing operations with high-speed steel or tungsten-carbide tools, a high-speed, sliding-gear-head lathe with a Timkenized spindle has been placed on the market by the Reed-Prentice Corporation, Worcester, Mass. The speeds for use with high-speed steel range from 18 as a minimum to 432 r.p.m. maximum, or with tungsten carbide from 52 minimum to 1,250 r.p.m. maximum. The motor recommended for regular production, using the high spindle speeds, is 5 hp., 1,200 r.p.m. The lathe has such features as a cam lever tailstock, front and rear connected rests, multiple-type toolholder and drive by multiple V-belts or chain from a motor mounted in the base. The machine may be arranged and equipped with a power-feed bed turret and front and rear connected rests for turret lathe operations.

The headstock incorporates a quiet, sturdy, and powerful sliding gear transmission, which includes only nine gears for eight spindle speeds, all these gears being of nickel-chromium S.A.E. No. 3250 steel hardened, and with teeth burnished and lapped after hardening. The gears slide on multiple-splined shafts of heat-treated, nickel-chromium steel running in radial ball bearings. Splash lubrication is provided, a sight oil-level gage and draining plug being accessories. The main drive shaft is provided with a disk clutch and brake.

Four Timken taper roller bearings carry the S.A.E. No. 6140, heat-treated, chrome-vanadium, alloy-steel spindle, thrust being taken on the front bearings. The rear bearings are mounted in a snugly fitted floating sleeve to compensate for slight variations in the spindle and housing resulting from temperature changes.

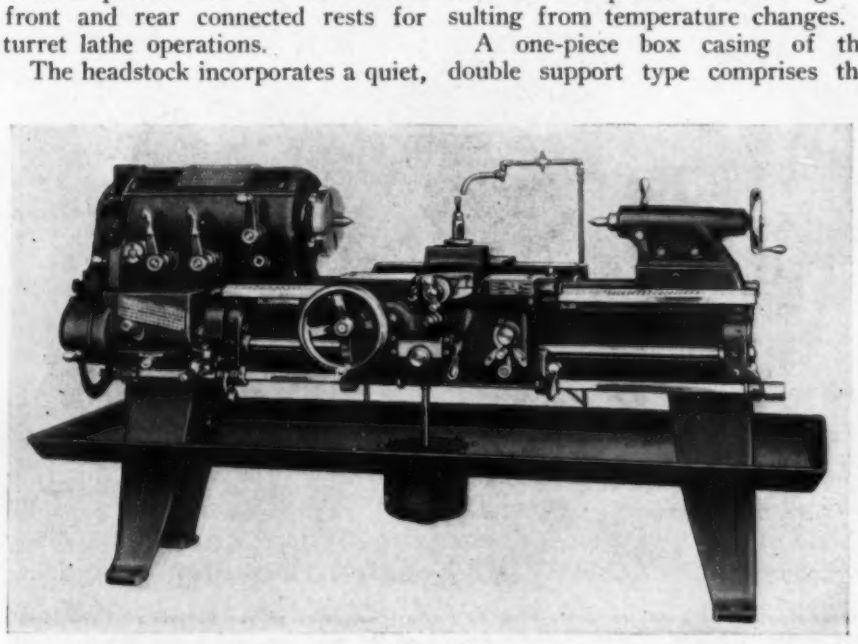
A one-piece box casing of the double support type comprises the apron, which has a central oil reservoir. All apron bearings are bronze bushed. One lever operates the double disk clutch for either cross or longitudinal feeds and an interlocking device prevents engagement of the feeds and threads at the same time. The rack pinion may be withdrawn from the rack when cutting threads.

Adjustable and detachable front and rear rests may be supplied or these may be had cast integral. On the adjustable and detachable type, the rear block is tongued and screwed into the slot in the back of the plain T-slot block. An adjustable block is tongued and clamped to the rear member by four clamping screws. Adjustment permits the changing of the center distance between the T-slots. The entire unit is operated by the standard cross feed screw in the carriage and positioning of the tools in relation to the work is controlled by the use of positive cross stop having two sets of knurled stop collars.

Connected Front and Rear Rests

On the type cast integral, two separate series of operations can be performed independently. This type is fitted to the dovetail on the carriage and is operated by the standard cross feed screw. On the side of the block are two lugs carrying adjusting screws, which with the stop bracket mounted on the side of the carriage, permit the front and rear tools to be located independently in relation to the work. The heavy-duty toolpost fits the T-slot of the compound rest. All parts are steel forgings. It can be adjusted vertically and swiveled to any angle. A four-way, turret-type toolpost is also available and it may be indexed accurately for positioning the four tools. One movement of the lever releases the lock and indexes. It has a capacity for bit shanks up to 1¼ in. in height by ⅝-in. wide.

The cam lever tailstock permits rapid removal of work carried on centers. The spindle is provided with a 2-in. traverse. Among the attachments are the standard taper attachment, the front cam slide taper attachment, and collet attachment. The standard taper attachment is the same as regularly supplied with a standard engine lathe and movement is effected direct to the bottom block



Reed-Prentice High-Speed, Sliding-Gear-Head, Production Lathe

by an extension clamped to the taper bar shoe. The maximum length of tapers obtainable are 18 in. in 15 deg. or an equivalent of 3½ in per foot. The carriages are drilled for operation of the taper attachment at any time.

The front cam slide taper attachment consists of cast-steel block mounted on a plain T-slot block. A cam path of desired shape is cut in a long bar sliding parallel with longitudinal movement of carriage. At right angles is a slide carrying a tool with a cam roll which follows the cam path. Knurled head adjusting screws permit proper setting of the cam slide and act as positive bed stops for the carriage movement. The tool block is adapted for the addition of stationary tools for other operations, as multiple-tool holders. The collet attachment is of standard lever-operated type and has a capacity up to 1 in. in diameter. It is of the push rod construction similar to that found on the hand screw machine. The oversize type can be supplied with capacity up to 1¼ in. for round stock of short lengths, or the full capacity of the hole in the spindle, 1¼ in., for long shafts.

Specifications: 14-in. machine: swing over compound rest, 9 in.; swing taken between centers on 6 ft. bed, 31.; steadrest capacity, 4¾ in.; toolpost takes ⅝x1-in. tool; hole through spindle, 1 5/16 in.; taper hole in spindle, No. 5; feeds with quick-change gear mechanism, 41, ranging from 0.0035 to 0.112 in.; floor space, 6 ft. bed, 7 ft.x3 ft.; weight, 2,450 lb. Specifications peculiar to the 16-in. lathe: swing over compound rest, 11 in.; tools taken,, ⅝x1¼ in., and weight, 2,675 pounds.

McKinney Type "C" Universal Rolling Machines

HEAVIER construction and greater capacity than found in the Type "B" machine are embodied in universal Type "C" rolling machines announced by the McKinney Tool & Manufacturing Company, 1688 Arabella Road, Cleveland, Ohio. These units are made in three sizes to roll 16, 14, and 10 gage metal, respectively, depending upon the material, temper, width of section, number of angles, sharpness of radii, and other governing factors. Unit construction is employed for these machines. Each unit carries two pairs of work spindles and the parts of one unit are interchangeable with like parts in another.

As in the Type "B" machine, sliding front housings are employed. Regardless of whether a wide or narrow section is being rolled, the housing is placed up against the work roll to give support and is held to the bed by clamp bolts in T-slots. To change the rolls, the clamp bolts are loosened and the housing slid off the base, after which it is a simple matter to remove and change the roller dies. Another advantage is that the machines may be used as a regular two-housing machine, or if desired for light work, the housing may be slid back exposing the end of the work spindles. The rolls may then be mounted outboard.

Another feature that adds to the speed of changing from one job to another is the adjustable guide supports. These are suspended from the top of the main housing by an adjusting screw and are movable up and down in a guide at the back. By the use of a simple link system the top spindles have an up-and-down adjustment of 5-in. with the gears in mesh. This allows the use of roller dies of various sizes and makes the rolling of difficult sections much easier. It also allows frequent redressing.

A two-speed gearbox is regular equipment, as well as a built-in friction clutch, which may be operated from any point along the front of the machine. All drive shafts are of alloy steel and the work shafts are of chrome-nickel steel, hardened and ground. Bronze bearings are supplied ordinarily, but Timkens are available at extra cost. Lubrication is supplied by Alemite fittings.

The three sizes are known as the Nos. 1-C, 2-C and 3-C. The numbers of work spindles range from 2 to 20 in each case, the diameters ranging as follows: 2, 2½ and 3 in.

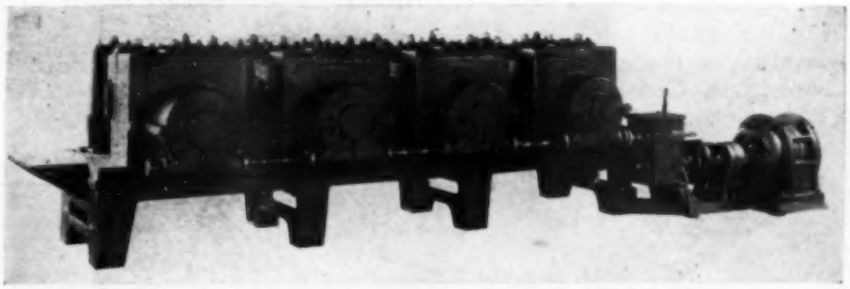


Fig. 2—Rear view showing the simple manner in which drive is effected to each unit

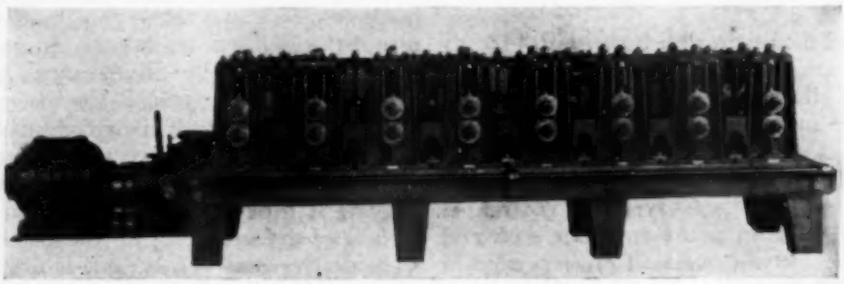


Fig. 1—Front view of the McKinney Type "C" Universal Roller Die Forming Machine

The widest sheets rolled are 12, 16 and 20 in. Distances between stands, 17, 17 and 19 in. respectively, and capacities as previously mentioned.

"Red Junior" Barrett Lift Truck

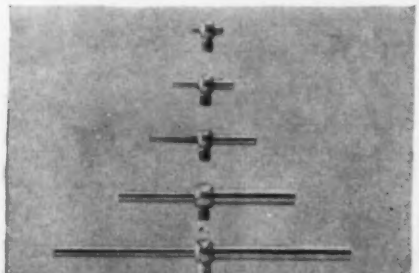
Easier lifting and faster operation are claimed for "Red Junior" lift truck announced by the Barrett-Cravens Company, 1328 W. Monroe St.,

"Red Junior" Barrett Lift Truck

Chicago, Ill. This truck will lift a load with a single stroke of the handle and from any angle. Its features include spring handle hold-up to prevent the handle from falling to the floor, to take the weight from the trucker's hands; roller bearing latch catch, and an automatic engaging latch for lifting loads and for eliminating the necessity of stepping on a pedal prior to lifting a load. Hyatt roller bearings and Alemite lubrication are other features. The truck has a capacity of 2,500 pounds.

Brown & Sharpe No. 590 Telescoping Gages

For determining difficult internal measurements, the Brown & Sharpe Manufacturing Company, Providence, R. I., has announced the No. 590 telescoping gages for use with micrometers. These gages comprise five heads, which are interchangeable on one handle. The telescoping head is compressed and inserted into the hole or slot to be measured where it expands to the exact size of the hole. A turn of a knurled screw on the end of the handle locks the head and the gage is then removed and measured with a micrometer.

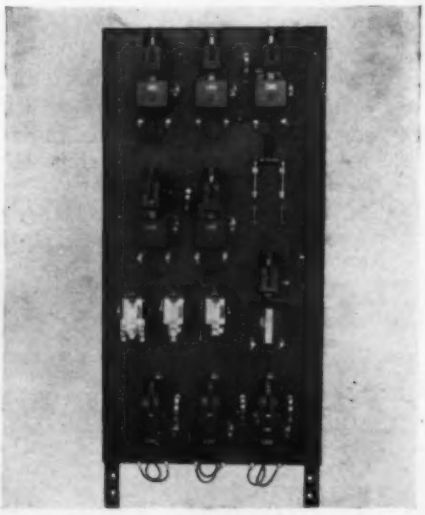


Brown & Sharpe No. 590 Telescoping Gages for determining difficult internal measurements with a micrometer

Each head is a self-contained unit. Measuring surfaces of the heads are ground on the radius of the smallest hole the gage will enter, thus adapting them especially for measuring curved surfaces. The ends of heads are hardened.

General Electric Crane and Hoist Controls

The General Electric Company, Schenectady, N. Y., has announced a redesigned line of magnetic control panels for use with cranes. Two types of control are involved, one, designated CR-4426, is for use on the bridge and trolley motions of cranes,



General Electric Magnetic Control Panel for use with cranes

and the other, designated CR-4422, is for use on hoist motions.

All of the advantageous features of the superseded lines of panels are included in the redesign, and a number of improvements have been incorporated. Each type of control is available in two forms, one with and one without overload protection. On both of these forms the circuit breaker contactor, which opened only on overload, has been replaced by a line contactor. This is placed in the opposite side of the line to the reversing contactors and opens each time the master switch is returned to the off position. This allows complete isolation of the motor and starting resistor from the sources of power when the master switch is moved to the off position.

A three-point, cam-operated master switch is used with the control. Overload relays are also incorporated,

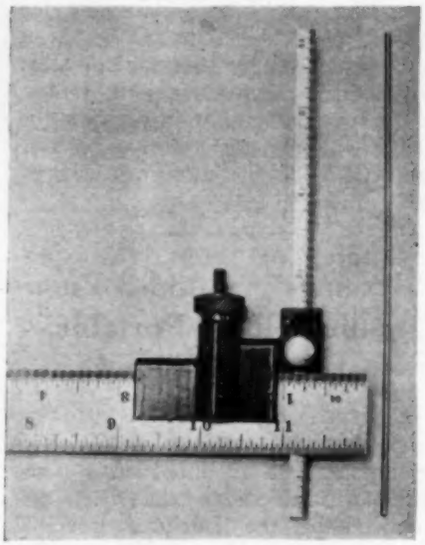
Three-point, cam-operated master switch used with the General Electric crane control panel

which allow a greater calibration range and permit the use of but one coil instead of two or three for a given contactor size. The control is available either with or without shunts. The standard line also has fewer bases per panel and has more symmetrical panel arrangements.

Brown & Sharpe No. 468 Depth Gage Attachment

A combination square or set may be converted into a depth gage by the use of the No. 468 depth gage attachment announced by the Brown & Sharpe Manufacturing Company, Providence, R. I. This attachment measures directly from the lower edge of the blade of the square or set and is read easily. It is particularly useful for measuring the depth of wide recesses. The frame is drop forged and japanned.

The English measure attachment



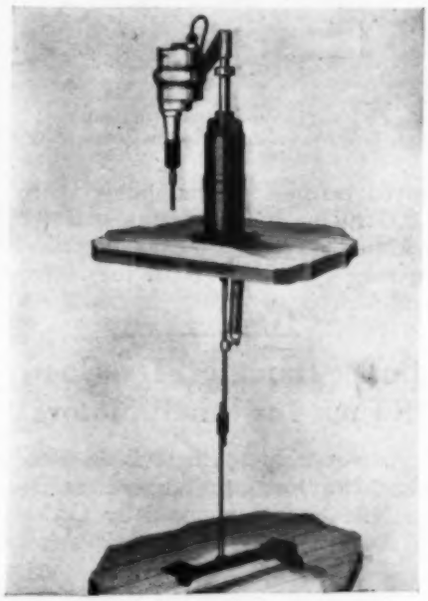
Brown & Sharpe No. 468 Depth Gage Attachment, which may be used with a combination square for measuring the depths of wide recesses

has a range of 0 to 4½ in. with a 6-in. blade graduated in 32nds and 64ths, or 64ths and 100ths. A blade with 32nds and 64ths graduations is furnished unless otherwise specified. The metric measure attachment has a range from zero to 114 mm. with a 15-cm. blade graduated in mm. and 0.5 mm. A rod $\frac{5}{64}$ in. in diameter is furnished for use in small holes. The No. 468 depth gage attachment may be used on 9-, 12-, 18- and 24-in. B. & S. combination squares and sets. It cannot be used on combination squares and sets with heavy blades.

Ray Type CBF-B Electric Screw Driver

A foot-controlled bench type electric screw driver, known as the Type CBF-B, has been placed on the market by the Ray Machine Company, 5403 West Lake St., Chicago, Ill. The screw driver unit was described on page 1024, Vol. 71, of the *American Machinist*. It is driven by 110-volt current and is supplied for 60-cycle, single-phase circuits ordinarily, but can be furnished for others if desired.

This foot-controlled bench mounting has many uses in assembly operations. The counterbalanced screw-driving unit is under the control of the operator at all times and is poised so that it may be operated without tiring effort. A cast-iron base is provided, which is attached to the top of the assembly bench or conveyor. This base encases the counterbalance and provides two large bearings for the vertically sliding seamless steel tube that supports the screw-driving unit. To permit adjustment of the unit for various heights of parts being assembled, this vertical sliding tube is made to telescope and is fitted with a quick-acting and positively locking device.



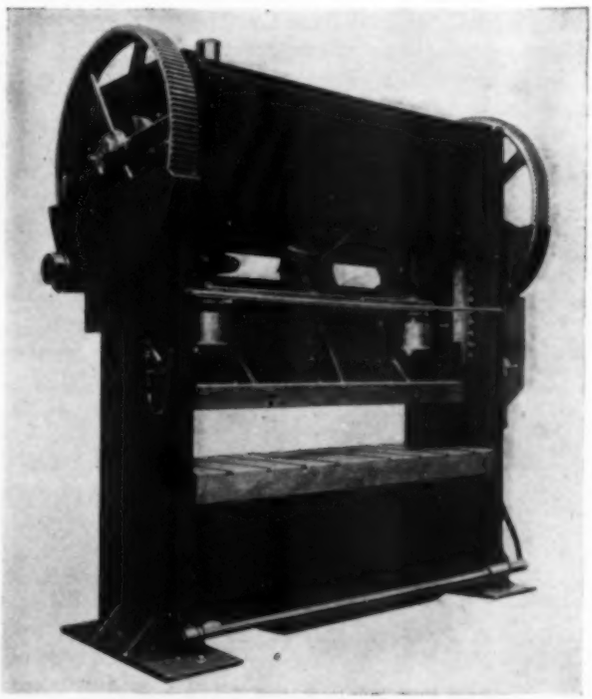
Ray Type CBF-B Electric Screw Driver arranged as a bench type with treadle control

The screw-driving unit is secured to the vertical tubing support by means of a cast-aluminum bracket terminating in a split clamping ring that surrounds the motor stator, permitting the complete removal of the unit should it be required. An easily adjusted and accessible stop collar affords means for regulating the length of the vertical stroke up to 4 in. For controlling the operation of the screw-driving unit, a conveniently placed treadle is supplied. This is adjusted readily to different heights of benches or to meet operating conditions and the comfort of the operator. The adjustable spring to return the unit to the top position is only under sufficient tension to offset the weight of the operator's foot. Current is supplied to the unit by means of a flexible conducting cord which passes through the center of the mounting and terminates under the bench in a suitable attachment plug. The mounting is finished in black enamel, natural aluminum, and cadmium plating.

Verson Straight-Side, Steel-Frame Presses

To the line of all-steel inclinable presses recently announced, the La Salle Machine Works, Inc., 3013 South La Salle St., Chicago, Ill., has added a line of straight-side presses having single, double, or triple cranks. The bed, overhead, uprights, ram, and bull gears are all steel-plate construction and are welded into units. This style of construction permits the presses to be built to the customer's specifications.

The heavier types of these presses include such features as motor adjustment of the ram, Texrope drive, one-shot lubrication, bronze-bushed main



Verson Straight-Side, Steel Frame Press

bearings, Timken bearings on the back shaft and the flywheel, multiple-disk friction clutch, and shear pins on the back shaft.

"Kleenkut" Shear Knives

Shear knives made from induction furnace steel are marketed under the trade name of "Kleenkut" by the Heppenstall Forge & Knife Company, Pittsburgh, Pa. These knives are for use in tin plate mills, sheet mills, strip mills and other industries where large daily tonnages are required. They are of an alloy composition claimed to give several times the life of ordinary tool steel shears.

Reed-Prentice Improved No. 3 Die Sinker and Miller

A Timkenized longitudinal feed screw on the saddle and a rotary table are the principal improvements made on the No. 3 miller and die sinker manufactured by the Reed-Prentice Corporation, Worcester, Mass. The Timkenized longitudinal feed screw for the saddle is illustrated in Fig. 2. At the front and right-hand end of the table is also located a handle for the hand feed, providing a 1 to 1 ratio. This allows hand longitudinal feed from the front of the machine as well as at either end of the longitudinal screw. The machine also has a 16½-in. rotary table equipped with an oil trough and hand and power feed. The handwheel for the hand feed is located at the front of the machine instead of at the rear as in the past and provides centralized control. The ball bearing spindle and pulley construction employed permits spindle speeds up to 4,000 r.p.m. Other features of the machine are the same as described on page 874, Vol. 70, of the *American Machinist*.

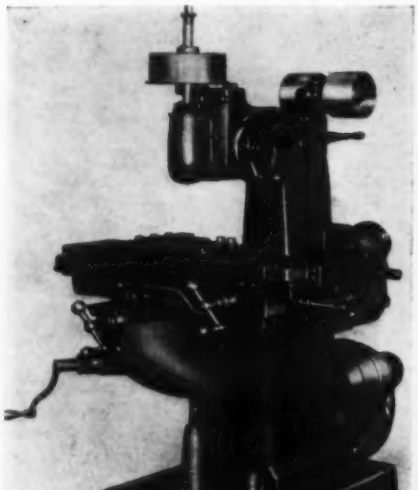


Fig. 1—Reed-Prentice Improved No. 3 Die Sinker and Vertical Miller

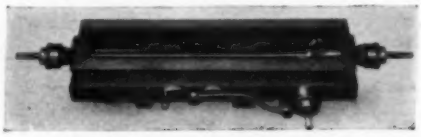


Fig. 2—A Timkenized longitudinal feed screw is employed in the saddle

Cutler-Hammer Overload Switch for Small Motors

A free-tripping thermal overload switch for fractional-horsepower motors has been announced by Cutler-Hammer, Inc., 2-12th St., Milwaukee, Wis. It is known as the Bulletin 9101. According to the manufacturer, the switch provides positive protection against motor burnouts due to overloads, prevents blown fuses and other electrical troubles caused by overloads. Push buttons furnish convenient starting and stopping control. The switch has a time-limit type of thermal overload, which is furnished in numerous ratings up to and including ¾-hp., 110- and 220-volt a.c., and ½-hp., 115 volt d.c. When an overload trips the switch, it is re-set by simply pressing the start button; this also restarts the motor. If the overload condition persists, the motor will not start, so that positive protection for the motor is assured at all times.

Cutler-Hammer Overload Switch for fractional-horsepower motors

"Hercules" No. 34-3 Pneumatic Drill on Portable, Adjustable Stand

Designed especially for use on large dies and castings, a No. 34-3 pneumatic drill mounted on a portable, adjustable stand has been announced by the Buckeye Portable Tool Company, Dayton, Ohio. The capacity of the drill is 1¼ in. in steel. It is equipped with a No. 3 Morse taper socket and has a feed of 7 inches. Maximum elevation of the tool is 45 deg. above and 25 deg. below the horizontal. The stand may also be raised or lowered, maximum height being 44½ in., the minimum, 32½ inches, which is a convenient range for most of the work encountered.

Buckeye No. 34-3 Pneumatic Drill mounted on a portable, adjustable drill-stand for use on large dies and castings

The pedestal has a three-leg base, with double wheel rollers on each leg. In the base is an oil reservoir with a capacity of ½ gal. The air power is controlled by a foot air throttle, leaving the hands entirely independent of

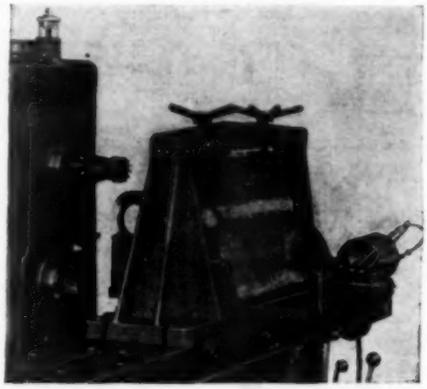
the air control. An adjustable needle valve connects the oil reservoir to the air hose just above the throttle and permits the proper amount of oil to pass through the hose to the rotor, insuring ample lubrication of that part for a minimum of two weeks constant operating before refilling the reservoir. The three-leg base permits the use of the drill in close quarters and the anchoring chain also facilitates the operation.

EQUIPMENT ADAPTATIONS

Recently Developed by the Makers

Special Head for Milling Locating Pads on Tractor Blocks

Milling locating pads on tractor cylinder blocks is accomplished on a No. 1404 "Mil-Waukee-Mil" built by the Kearney & Trecker Corporation, Milwaukee, Wis., and equipped with a special two-spindle head with fixed center-to-center distances, as illustrated. The special fixture holds one cylinder block, and the cutters employed are right- and left-hand 3-in. shell end mills. The top spindle is solidly mounted in the housing while the bottom spindle is set in a quill and has a micrometer screw for end adjustment.



Kearney & Trecker No. 1404 "Mil-Waukee-Mil" set up with a special two spindle head and special fixture for milling the locating pads on tractor blocks

The work holding fixture consists of a heavy base with an upright housing at each end to which the clamping bridge is bolted. In the base of each housing is a raising block which is operated by the air cylinder bolted to the right-hand end of the table.

A cylinder block is put into the fixture by sliding it on two hardened rails back against an approximate stop pin. The air valve lever is then turned, causing the two raising blocks to lift the cylinder block up to a set height. This upward movement is controlled by set screws which insure the cylinder block being raised to the proper height at each end. Thus the work is located in the horizontal plane.

To locate the work in the vertical plane a fixed cone center is screwed down into the cylinder bore at one end, and to steady the work a sliding wedge is screwed down into the cylinder bore at the other end.

When the block is located and clamped, the feed is engaged and the pads milled. The upper cutter face mills only; the lower cutter face mills and cuts a shoulder. These finished surfaces are used for locating.

Production, 18 to 20 cylinder blocks per hour.

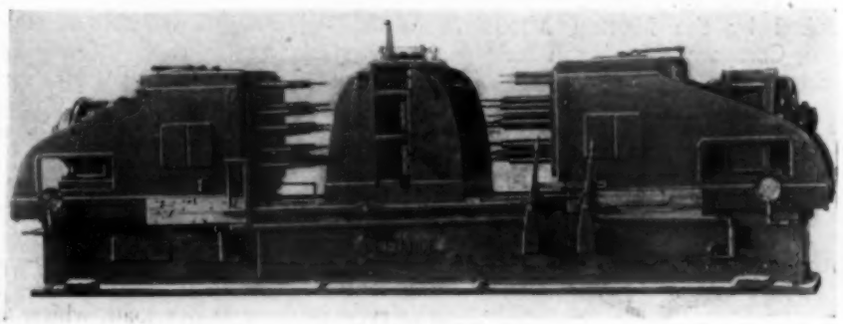
Defiance Multiple-Spindle Cylinder-Head Drilling Machine

All holes in both sides of cylinder-head castings can be drilled on the multiple-spindle, opposed, fixed-center-head, two-way drilling machine announced by the Defiance Machine Works, Defiance, Ohio. This type of machine is also adapted for production drilling on motor blocks, transmission cases, and similar work. The heads and fixtures on the machine are always special.

The multiple-spindle fixed-center heads are equipped with heat-treated, alloy steel spindles running in bronze-bushed bearings or anti-friction bearings, as desired. The spindles are driven by heat-treated, stub-tooth gears, which are inclosed and oiled continuously by force-feed lubrication. As illustrated, the machine has 77 spindles in the two heads. One head is driven by a 30-hp. motor and the other by a 40-hp. motor, both motors running at 1,200 r.p.m. These motors are direct connected through flexible couplings.

The fixture is of three-station design, and as the cylinder head progresses from the first to the third station, it completes the drilling of all holes at one cycle of the machine. A heavy jig plate is mounted on each side. It is a part of the fixture and carries a removable jig eye for guiding the various sizes of drills.

Two Oilgear pumps drive each head independently. One head travels in advance of the other by drilling through the center and starts to reverse before the second head reaches the center, as several of the holes are drilled clear through on this particular job. Each head has a stroke of 24 in., with rapid traverse forward, and then the rate of feed desired while cutting, followed by automatic kick-off and automatic return movement. Plenty of head travel is available away from the fixture for removing and changing cutting tools. The machine can be fitted with a mechanical screw feed instead of Oilgear feed,



Defiance Special Drilling Machine, which produces one completely drilled cylinder head every 4 min., including the loading and unloading time

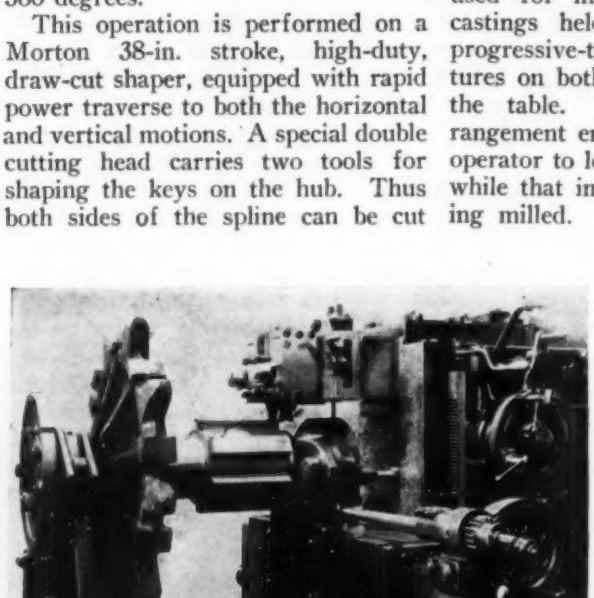
with rapid traverse movement, if desired. A 3-hp., 900 r.p.m. motor is used for driving each Oilgear pump.

Floor space occupied, 17 ft. 2 in., by 61 in.; net weight, 27,500 pounds.

Machining a Cast-Steel Hub on a Draw-Cut Shaper

By means of the special attachment illustrated splines may be cut on such parts as shown in the set-up, the piece in question being a cast-steel drive sprocket. The attachment is indexed and equipped with rotary feed for circular cutting. It will rotate through 360 degrees.

This operation is performed on a Morton 38-in. stroke, high-duty, draw-cut shaper, equipped with rapid power traverse to both the horizontal and vertical motions. A special double cutting head carries two tools for shaping the keys on the hub. Thus both sides of the spline can be cut at one operation. The machine was supplied by the Morton Manufacturing Company, Muskegon Heights, Michigan.



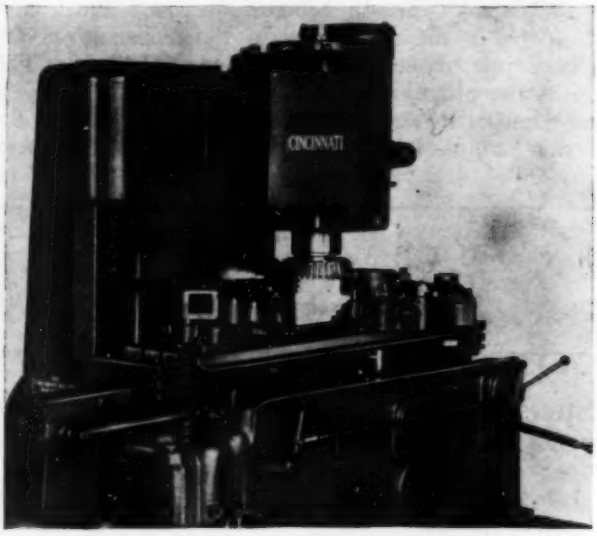
Morton 38-Inch High-Duty, Draw-Cut Shaper arranged for machining the keys in the hub of a cast-steel drive sprocket weighing 500 pounds

Milling a Crankcase Front Cover

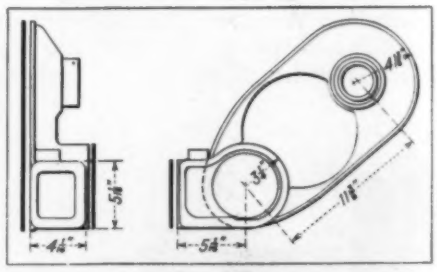
Milling the flange face, bottom pad, and side cover pads of a crankcase front cover is performed at an increase in production of 50 per cent over former methods on a No. 4-48 plain Cincinnati "Hydromatic." In this case the regular head on the machine is replaced by a vertically-adjustable overhung rail. A standard spindle carrier is mounted on the rail. The spindles have both vertical and horizontal adjustment, enabling them to be used at any time for milling work of slightly different dimensions.

Reciprocating table feed controlled automatically by dogs is used for milling the castings held in the progressive-type fixtures on both ends of the table. This arrangement enables the operator to load and unload the work while that in the other fixture is being milled. A table stop lever and plunger are provided for stopping the table automatically at the completion of each cut.

The crankcase cover is placed in the fixture at the left end of the table to have the flange face milled by the vertical cutter. Location is obtained by setting the unfinished bosses of the casting against side and bottom stops. Two adjustable work rests are provided for obtaining a firm bearing for the casting. Bolt clamps hold the piece in place. The 12-in. inserted-tooth face mill on the vertical spindle runs at 38 r.p.m. The table feed is at a rate of 8-in. per minute. While the flange face on the piece in the left-hand fixture is being milled, the operator loads a piece finished in this position into the right-hand fixture. At this position the part rests upon the milled flange face and is located against two fixed end stops by a cam clamp. Two bolt clamps hold it in place. The second operation consists of milling the bottom and side cover pads by means of the horizontal and vertical cutters. The respective spindle speeds on the 6 and 12-in. face mills used are 83 and 38 r.p.m. Production obtained is 15 pieces per hour.



Milling the flange face, bottom pad, and side pads of a crankcase front cover on a Cincinnati No. 4-48 plain "Hydromatic" miller



Crankcase front cover

Bottle Molds Milled on the Cincinnati Duplex "Hydromatic" Miller

An increase in production of 700 per cent is said to have been obtained on rough and finish milling of the parting face of bottle molds on a No. 4-36 duplex Cincinnati "Hydromatic" equipped with special fixtures. One man operates the machine. The production is 34 pieces per hour.

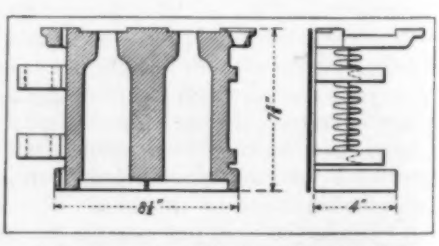
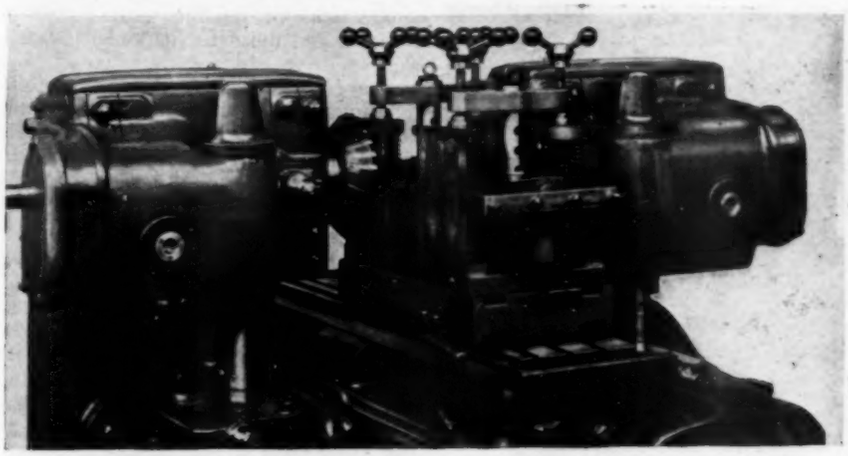


Diagram of mold for glass bottle. The parting faces are milled



Molds for glass bottles are rough and finish milled at the rate of 34 pieces per hour on this Cincinnati No. 4-36 Duplex "Hydromatic" equipped with special fixtures. Increase in production over previous method, 700 per cent

A special fixture adjustable for a large range of sizes is mounted on the top of a standard 16 x 30-in. index base. The flange ends of the molds are milled previous to the operation to be described and they form excellent support. Side location of the molds is obtained by two fixed stops and one adjustable stop. Pilot wheel clamps hold the parts.

The cycle of operation is as follows: The operator loads two molds, one in each fixture on the left-hand side of the index base. Two pieces that have been rough milled previously are already in place in the other side of the fixtures adjacent to the right-hand cutter for the finishing operation. Rapid advance of table to the cut takes place at 300 in. per min. and slows down to 13-in. per min. for duration of the cut. The two pieces on the left-hand side of the fixture are rough milled and those on the right-hand side are finish milled. Two 14-in. inserted-blade face mills running at 28 r.p.m. are used. Rapid return of the table is at 300 in. per min., controlled automatically by dogs. The index base is then swung about, bringing the parts rough milled into position for the finish milling operation.

"Milwaukee" Milling Machine With Special Two-Spindle Head

Channeling forged alloy steel airplane engine articulated rods is done accurately and with a fine finish on the Kearney & Trecker No. 3 "Milwaukee" heavy plain milling machines equipped with a special two-spindle head. Two fixtures, each holding two rods, are employed. The cutters are two 1¼-in. end mills.

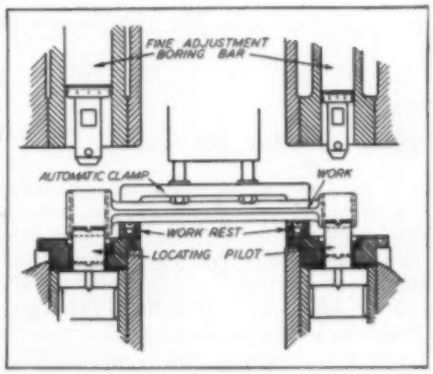
The two-spindle vertical head is gibbed and bolted solidly to the column and supported by the double overarms. The spindles have a fixed distance center to center—the inside spindle is solid in the head, while the outside spindle is set in a quill to allow vertical adjustment. The head is Timkenized throughout.

The rods locate in the two opposed fixtures from the bores and faces at each end. A C-washer and nut are used at each end to hold the rod. The rods are supported on each side by floating equalizing vise jaws. These jaws prevent the walls of the rods from spreading under pressure of the cut, and insure a smooth finish.

To mill the channels, the table feeds along the first fixture milling the first two rods and then automatically stops. The operator lowers the knee, rapid traverses the table to position for milling the workpieces in the second fixture, raises the knee to the proper height, and engages the table feed to mill the rods in the second fixture. While one side is in the cut, he unloads the other fixture, brushes off the chips, and reloads.

Diamond Boring An Aviation Articulated Rod

Aircraft engines must be ready to run when assembled for there is neither time nor opportunity for wearing-in processes. As crank and piston ends of connecting rods must be accurately machined to very close limits, diamond tool boring them gives precision, accuracy of diameter, and roundness and parallelism of



Fixture for diamond boring aviation articulated rods

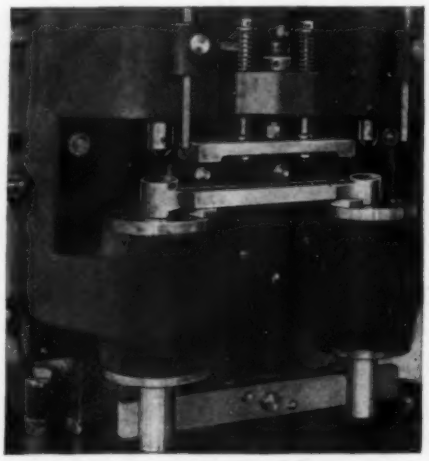
Channeling airplane engine articulated rods on a "Milwaukee" No. 3 heavy plain milling machine equipped with a special two-spindle head

holes. Other advantages are the ease and speed of original assembly and replacement in overhaul. Lubrication is effective because of uniformity of clearances, and smoothness of operation is obtained also because of the close tolerances.

MACHINING DATA

Part	Aviation articulated rod
Material	S.A.E. bronze
Operation	Finish bore large and small end (one operation)
Large bore diameter	1.500 inches
Large bore length	.2 inches
Small bore diameter	1.247 inches
Small bore length	1.5625 inches
Spindle speeds	4,000 r.p.m.
Feed	.0008 inch per rev.
Depth of chip	.005 inch
Limits	.00025 inch. Holes in both ends must be parallel within .003 inch in 6-inch radius
Machine cycle	1 minute, 1 rod per cycle
Chucking time	5 seconds

The diamond boring machine, of



Close-up of a Coulter Diamond Borer machining an articulated rod

which the close-up of the tooling is given, was furnished by the Automatic Machine Company, Bridgeport, Connecticut.

REVIEW · OF · RECENT · PATENTS

Relating to the Machinery and Metal Products Industries

Metal Working Machinery

A milling machine with automatic means of indexing the work, and a head for carrying two cutters into and out of engagement with two pieces of the work simultaneously, is covered by patent 1,374,308 assigned to the Sundstrand Machine Tool Company.

William Wallace Potter, Pawtucket, R. I., was granted patent 1,733,426 for a machine tool with a mechanism for controlling relative motion between the workholder and the toolholder.

The Niagara Machine & Tool Works is assignee of patent 1,735,243 for a slip-roll forming machine having an upper roll pivotally mounted at one end and capable of being swung horizontally.

An automatically operated centering machine using a variable speed cam for actuating the spindles is the subject of patent 1,735,361 assigned to the Pratt & Whitney Company.

Penrose R. Hoopes, Hartford, Conn., was granted patent 1,733,263 covering a machine for heating and forging metal articles.

Patent 1,733,316 was granted Henryk Olsen Rovig, of Norway, covering a combination of feeding rolls and a shear for cutting off bands.

Cincinnati Grinders Incorporated has been assigned patent 1,733,492 for a grinding machine with a mechanism for moving the work to successive parallel positions.

A grinding machine, covered by patent 1,731,719, assigned to The Heald Machine Co., comprises a rotary work holder movable with respect to a grinding element, means arranged to gage the work automatically during the grinding operation, and several other parts of a co-operating nature.

TRADE PUBLICATIONS

DROP HAMMERS, STEAM. The Erie Foundry Co., Erie, Pa., has published Bulletin No. 230, which covers the Type G steam drop hammers. This contains more engineering data and maintenance instructions than were included in previous bulletins. The construction is thoroughly described and illustrated, and instructions given for erection and maintenance. The catalog contains 23, 11x8½-in pages.

FLEXIBLE SHAFT HANDBOOK. The S. S. White Dental Manufacturing Co., Industrial Division, New York, N. Y., has published the "Flexible Shaft Handbook," which contains five sections on: applications of flexible shafts; characteristics and the construction of flexible shafts; drive shaft ends; casings and casing ends, and shaft and casing combinations. It will be seen that the handbook is an exhaustive treatise on flexible shafts in machine design. Many photographs and diagrams are used throughout. The handbook contains 119, 7½x5-in. pages.

GENERAL ELECTRIC PUBLICATIONS. The General Electric Co., Schenectady, N. Y., has issued several bulletins as follows: Bulletin 19F, superseding 19E and in part 181B, on Type CR-7006-D5 and -D7, a. c., inclosed magnetic switches for a. c. motors; Bulletin 904C, superseding 904B, on single-stage centrifugal air compressors for cupola blowing; Bulletin 1045A, 1045, on Type CL-2 control and instrument switches; Bulletin 1196 on Type CN-1 air circuit breakers for 650 volts., a. c. or d. c. circuits, and Bulletin 1231 on quiet-operating induction motors of the 900 and 500 series frames.

GRINDING MACHINES, TOOL AND CUTTER. The Norton Co., Worcester, Mass., has published a catalog entitled "Universal Tool and Cutter Grinding Machines," which describes the Nos. 1 and 2 machines and the various attachments. Specifications are listed. The catalog contains nineteen 11x8½-in. pages.

HARDNESS TESTING. The Wilson Maeulen Co., Inc., 730 East 143rd St., New York, N. Y., has published a booklet entitled "A Method of Precision Hardness Testing adapted to Production Testing in Industrial Metal Working." The operation of the machine and the advantages for this class of work are cited and several photographs are given.

FIRE PROTECTION APPLIANCES. The National Board of Fire Underwriters, 207 East Ohio St., Chicago, Ill., has published a supplement to the July, 1929 List of "Inspected Fire Protection Appliances," as of January, 1930. This listing and the original listing of July, 1929, must be consulted together to obtain complete information relative to the names of manufacturers and appliances.

GRAY-IRON FOUNDRIES, SURVEY OF. The U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce, has published bulletin No. 29, entitled "Survey of Gray-Iron Foundries," which is a statistical analysis of the operation and production of 646 gray-iron foundries in the United States. This report is an analysis of the mechanism of the gray-iron foundry industries at large from the point of view of efficiency in production. The booklet may be obtained from the Superintendent of Documents, Washington, D. C., for fifteen cents.

NEWS
OF THE WEEK

McGraw-Hill Company Loses Two Men Well Known in Publishing Circles

THE McGraw-Hill Publishing Company has lost, during the last two weeks, two men well-known and well-beloved in technical publishing circles. Charles Tripler Hutchinson, president

Charles T. Hutchinson

Joseph H. Bragdon

of the McGraw-Hill Company of California and publishing director of *Electrical West*, died on Feb. 12 in Oakland, Calif., at the age of 54 years. His death was mentioned in *American Machinist* last week. Joseph H. Bragdon, 43, publishing director of *Textile World*, vice-president and general manager of the Bragdon, Lord & Nagle Company division of McGraw-Hill Publishing Company, died suddenly of pneumonia on Feb. 19 at his home in New Rochelle, New York.

Mr. Hutchinson was manager of the Union Iron Works Company's mining machinery division when he resigned to take a similar position with the Joshua Hardy Iron Works in San Francisco. He founded *Western Engineering* in 1912, holding the position of editor until 1915, when he became vice-president and general manager of the Dewey Publishing Company. In 1922, he joined the McGraw-Hill Company, and since that time has been prominently identified with the electrical industry in California. He was a member of the A.S.M.E. and of several prominent western organizations.

Mr. Bragdon joined the staff of his father's magazine, *Textile Manufacturers Journal*, in 1911, upon his graduation from Yale. In 1915, he was active in the merger which joined *Textile Manufacturers Journal* and *Textile World Record* into one publication, *Textile World*. He was a member of the executive committee and of the board of directors of the McGraw-Hill Publishing Company, and was past president of the New York Business Publishers Association and the Associated Business Papers, the latter office the highest honor which the business publishing profession can bestow.

* * *

Steel Founders Meet in Chicago

More than 100 steel foundrymen were present at the January meeting of the Steel Founders' Society of America held at the Hotel Sherman, Chicago. The outstanding feature of the session was the presentation by members of instances in which they had supplanted other products with steel castings. It was shown that castings could be made to replace built-up structural shapes, where vibration resulted in high maintenance or replacement costs.

L. S. Peregoy, Sivyer Steel Casting Co., Milwaukee, was elected permanent chairman of the Small Castings division. C. A. McDonald, Nugent Steel Casting Co., Chicago, delivered a paper entitled "Cost of Repair or Maintenance Labor in the Steel Foundry," which stressed the importance of foundries checking to see whether lower costs made possible by new equipment were offset by increased maintenance.

Wm. Donnelly, George H. Smith Steel Casting Co., Milwaukee, advocated adherence to a set of uniform customs regarding pattern equipment and the insistence on foundries receiving pattern of proper design and construction, in a paper captioned "The Complete Handling of Pattern Equipment by Steel Foundries."

* * *

Automotive Materials Subject of A.S.T.M. Meeting

At a regional meeting sponsored by the A.S.T.M., to be held at the Book-Cadallac Hotel, Detroit, March 19, special emphasis will be given to a discussion of automotive materials. Arrangements have been made for a "Symposium on Developments in Automotive Materials." Twelve formal papers will be presented which should serve to bring about considerable discussion of the several topics and thus make available much data of interest. In addition to the A.S.T.M. membership, the members of the local chapters of the S.A.E., A.S.S.T., and the National Association of Purchasing Agents are participating. The papers are being preprinted for distribution at the meeting and also in advance of the meeting to those requesting copies.

* * *

Encouraging Business Reports Continue

Detailed reports on the business situation reaching the headquarters of the National Business Survey Conference at Washington continue to be encouraging. Business is on the upgrade and the country is rapidly approaching the time for the ordinary revival of outdoor work, which will further accelerate progress, according to the Conference. The shock of the deflation in security prices has largely been absorbed in three months. Danger of a long depression appears fairly over, with every evidence of early renewal of the normal onward march of living standards and business progress. According to the Conference, American business is carrying out its pledge to make every effort to create and maintain employment until business momentum is fully regained and the emergency is over.

* * *

THE Western Metal Congress and Metal Exposition will be held in the Civic Auditorium San Francisco, Feb. 16-20, 1931.

Baldwin Locomotive Makes Progress Under New Management

UNDER Fisher management, George H. Houston, president of the Baldwin Locomotive Works, is developing an important group of manufacturing properties. His first move was the acquirement of the controlling stock interests of the Midvale Company, Nicetown (Philadelphia), a pioneer in the manufacture of difficult and highly engineered equipment requiring large forgings and castings made of special and alloy steels. This plant is one of the principal armament manufacturers of the country.

George Houston

Last fall the Southwark Foundry & Machine Company was acquired by stock purchase. During 1930 it is expected that this plant will be moved to larger quarters on the Baldwin tract adjoining Eddystone, Pa., after which it will be known as the Baldwin - Southwark Corporation. The Southwark company has specialized in the design and manufacture of difficult hydraulic machinery, presses, punches, shears, and similar machines, and has been engaged to construct much other complicated equipment requiring large and special plant facilities.

Recently, the company also acquired the George D. Whitcomb plant at Rochelle, Ill., manufacturer of industrial locomotives. The Baldwin company has for many years owned and operated the Standard Steel Works at Burnham, Pa., a company which specializes in the manufacture of tires for locomotive work and rolled steel car wheels by means of the short ingot process. This company also makes all kinds of locomotive castings and forgings.

Now, the Baldwin company has purchased 100,000 shares of stock in the General Steel Castings Corporation, approximately 25 per cent of the stock outstanding. General Steel Castings Corporation produces steel locomotive castings and will provide an adequate supply of castings for the Baldwin works in the future. Strange as it may seem, of all the companies in the group, locomotive business was least satisfactory, although it was better than it was in 1928.

The first combined summary of the companies was submitted to the stockholders a few days ago. Total sales for the year were $42,796,587.76, giving a net profit of $4,742,420, before income tax deductions. Gross fixed assets for the combined companies were $70,698,863, less $16,221,851 reserves for depreciation, which with current assets gives total depreciated assets of $98,855,991.

* * *

Paris To Be Host To I.S.A. Conference

Technical conferences under the auspices of the International Standards Association, of which the American Standards Association is now a part, will be held in Paris in May, 1930, according to a recent announcement. A series of meetings is planned on the occasion of the plenary assembly and council meetings of the I.S.A. Among the technical projects to be discussed will be those dealing with ball bearings, paper sizes, rivets, technical drawings, test pressures for stationary boilers, commercial zinc specifications, sieves, and introduction of standards to practice.

* * *

Skid Platform Standards Revised by Committee

At a recent meeting of the standing committee on the simplification of skid platforms, it was unanimously decided to revise the simplified Practice Recommendation as originally adopted and to submit to the industry for its signed acceptance the following uniform dimensions: clearance from bottom of runners or other supports to under side of skid platforms to be either 8 or 12 in.; and between inside of runners or other supports to be 29 in. Also overall dimensions for skid platforms used for shipping goods be either 33 in. wide by 54 in. long, or 42 in. wide by 66 in. long. The changes proposed are to be effective from March 1 of this year. When sufficient signed acceptances have been received, the revised recommendation will be printed in accordance with the usual procedure of the Division of Simplified Practice of the Bureau of Standards.

* * *

FREIGHT traffic handled in 1929 by the railroads measured in net ton miles was the greatest for any year on record. The volume moved amounted to 492,179,745,000 net ton miles, which exceeded by 3,477,920,000 net ton miles or seven-tenths of one per cent the best previous record, established in 1926.

* * *

AT THE annual meeting of the Society of Engineers, San Francisco, the following officers were elected for the year 1930-31: president, A. E. Zimmerman, Pelton Water Wheel Co.; vice-president, H. T. Sutcliffe, operating department, Pacific Gas & Electric Co.; treasurer, W. G. Rawles, East Bay Municipal Utility District, Oakland; secretary, H. D. Miller. Two directors were elected for the coming two years.

* * * *

British Machine Industry Steady But Slow In Spite of Increased Exports

By Our London Correspondent

THE last few months have proved disappointing in Great Britain. In some directions want of confidence is distinctly suggested. Future handicaps are being allowed to loom too large and the possibility, indeed probability, of increased taxation and the estimated effects of pending legislation on costs are clouding the vision of some industrialists and preventing enterprise. There is no doubt that modernization is needed.

Imports of machinery increased during the last year by 2,400,000 pounds sterling, and of electrical goods and apparatus by 1,795,000, while vehicles increased by 1,215,000. Exports of machinery increased by 637,000 pounds sterling, and of electrical goods and apparatus by 1,548,000, while exports in the vehicles class, including locomotives, ships, and aircraft, increased by 2,991,000.

The overseas trading of Great Britain in machine tools during 1929 constituted a record, the war period, of course, being left out of the calculation. Imports rose to 11,0771 tons, valued at 1,950,870 pounds sterling, the corresponding figures for the previous year being 8,790 tons valued at 1,404,059 pounds. (The ton is the English ton of 2,240 lb.) For the first time, exports of British-produced machine tools and parts exceeded two million pounds in value, the total being 16,234 tons valued at 2,153,014 pounds. Re-exports, that is, exports of imported machine tools, amounted to 375 tons in weight, valued at 72,875 pounds.

In consequence of the large increase in imports, the net exports declined, being valued at 275,019 pounds. The same is true of overseas trading in engineers' tools, which for present purposes include milling cutters, drills, stocks and dies, and similar tools, but excludes gages. Here imports were valued at 766,861 pounds, sterling, with exports of British produce at 690,097 pounds, and re-exports valued at 170,357 pounds, net exports being worth 93,593 pounds.

From the Board of Trade, the European edition of *American Machinist* has

obtained returns giving weights and values of the various classes of machine tools entered in 1929 as exports, imports, and re-exports. In each case, the lathe class predominates. Thus, in exports, lathes accounted for 5,401 tons, valued at 770,508 pounds, while similar imports amounted to 2,111 tons valued at 388,994 pounds, lathe re-exports weighing 89 tons, valued at 15,798 pounds. In exports, the next important item was drilling machines, namely, 2,417 tons valued at 339,699 pounds, whereas in imports grinding machines come second, with 1,616 tons valued at 357,813 pounds, drilling machines being again second in re-exports, at 81 tons valued at 14,647 pounds. In exports, the ton values of presses, punches, and shears and of planing and shaping machines are the lowest, while in imports, presses, punches, and shears, and drilling machinery were of lowest ton value, and in re-exports planing and shaping machines, and presses, punches, and shears, take the lowest positions.

MACHINE-TOOL CONDITIONS IRREGULAR

The high values both of exports and imports of machine tools suggest that last year this particular branch of engineering was well employed. Conditions however were and still are somewhat uneven, and firms can be found that must be described as slack, this being truer perhaps as regards heavy tools. In other sections the decline noticeable two or three months ago was for the most part only temporary. More particularly in the Midlands area, extensions of machine-tool shops have been made and are being made, and in one or two instances night work is still necessary. Against this has to be set the undeniable fact that, outside the electrical and automobile sections, the engineering industry as a whole is not very prosperous. Advances of wages have been refused on the ground that the industry has been unable to increase its earning capacity to any real extent while, apart from increasing foreign competition, home competition was described as desperate.

People are not wanting, therefore, to ask whether in the event of a real boom in industry the British machine-tool branch of engineering could meet the demand. In the past few years a number of firms have disappeared and others have been amalgamated out of existence. But the industry will probably be able to expand when it is necessary.

The firm of William Asquith, Ltd., Halifax, one of the original members, has re-joined Associated British Machine Tool Makers, Ltd. Because of difficulties regarding the letting of the exhibition hall, the next machine-tool exhibition to be organized by the Machine Tool Trades Association may possibly be held in London in July, 1932, instead of in September of the same year. Indeed, a few firms might not be surprised if the exhibition is again postponed. It is probable that, for the first time since the war, German machine tools will be included, so that the exhibition will be international.

Europe's Electro-Technical Industries Survey Their Export Markets

BY FRANCIS MILTOUN
Paris, France

THE world's electrical industries mark an especially significant point on the international barometer of trade exchanges. Raw materials are accessible to all, and selling conditions both in home and foreign markets are much the same. Prices seldom drop in one country but what they follow the same course elsewhere. Only the wage scale differs greatly.

A recent report of the Economic Committee of the League of Nations points out that the electric industries are not as great consumers of raw materials, in proportion to the world supply of these same materials, as is commonly supposed. That of copper carries the greatest proportion, perhaps 40 per cent. This has been curtailed by the adapted uses of aluminum. The bulk of raw materials entering into electrical machinery construction accounts for 50 to 80 per cent of the factory cost.

Of the total weight of raw materials used in the electrical industries, iron and steel products are approximately 22 per cent, copper 12.3 per cent, lead 5 per cent, aluminum 1.5 per cent and zinc 0.4 per cent, the remaining 54 per cent being accounted for by a greater number of raw and semi-raw materials than enter into the product of any other industry.

Especially is the situation in France mercurial. In general it would appear to give cause for congratulation but the executive secretary of the French electrical industries association, in a report, states that he, at least, does not ignore the progress being made by other countries nor the part their production plays in export markets where France itself seeks to distribute the surplus production of her full-capacity plants.

The French electrical industry, representing all branches of manufacture, had a capital investment of 300 million francs in 1913. Its annual output was valued at 200 million francs. Progress since the war shows an annual production valued at 4 billion francs from an invested capital of 2½ billion francs. It now furnishes employment to 100,000 workers. Exports are today valued at 450 million francs, rather more than 20 per cent of production, whereas in 1913 it was somewhat less than 16 per cent.

Germany had a preponderant position in foreign markets for electrical goods before the war and already has taken on an increase of 80 per cent in value, though today these exports amount to but 20 per cent of production. Europe takes 78 per cent of German exports in this line, of which 5.9 per cent goes to France, not a little of it as payments in kind to the Government on reparations account. Only in South America does the German export trade appear to have become stagnant, a result, doubtless, of the inroads which American exporters have made.

France, naturally, with 5 per cent more of its total production exported than is the case with Germany, looks to that country, however, as its logical competitor in world markets. The authority referred to does not ignore the part played by United States industry but resignedly seems to believe that it is so far in the lead that little or nothing can be done by anyone to catch up with it, though its exports represent but 8 per cent of total production.

Great Britain's exports are given as somewhat less than those of the United States, half of which are taken by Europe. Sweden is steadily increasing her exports, but chiefly through the Scandanavian countries and to a minor extent to Soviet Russia. Holland has increased exports nearly 50 per cent during the past two years. Switzerland has increased her foreign trade in electrical apparatus and equipment during the past year by 20 per cent.

Seeking to reconcile figures which have been submitted to the Economic Section of the League of Nations by Germany, Great Britain, and France, the following percentages have been presented for the leading European exporters of electrical goods:

	1913	1927
Belgium	—	1.3
Italy	1.2	.9
Austria	1.5	2.5
Czechoslovakia	—	.3
Hungary	—	.8
France	6.7	7.2
Switzerland	3.7	6.
Great Britain	23.4	30.8*
Germany	48.5	29.3*

*1926

Of world imports and exports in 1927, the most important categories are given in percentages as follows:

	Imports	Exports
Electrical machinery	26.4	24.4
Cable and insulated wire	15.4	15.5
Meters and measuring instruments	4.9	5.
Telegraph and telephone apparatus	15.3	14.5
Incandescent lamps	7.8	7.9
Miscellaneous	30.2	32.8

* * *

Atkins Banquets Employee 20-Year Club

On Feb. 1, E. C. Atkins & Co., Indianapolis, Ind., entertained the Atkins Pioneer "20 Year" Club at their annual banquet. The attendance was practically 100 per cent of 231 members, including nearly all of the 43 remaining charter members.

BUSINESS · BAROMETER

London Naval Arms Conference more vital to American business than the price problem and the tariff

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

IN AN economic sense our country is believed to be the most powerful in the world, and if there is any nation that can hold prices at a level that is equitable to both producer and consumer, the United States ought to be that nation. However, it seems questionable whether any attempt at stabilization can be successful if one nation undertakes to "hold the umbrella" for the protection of all the other nations. The flood that pours into the protected markets is almost certain to swamp them, and it is the fear that something of this sort may happen that caused the decline in last week's commodity markets, and has slightly undermined the cheerful confidence hitherto manifest in the stock market.

The truth is that control of commodity prices is a good deal like Prohibition. There are some who believe it can be enforced. There are others who doubt this, and last week's doubters outnumber those who are confident that with the money and credit at his disposal Uncle Sam can hold up the world's prices for all the great commodities that are produced in this country, including milk and cheese, as well as several other staples that do not figure very frequently in the commercial reports.

There are many who believe that our government has bitten off more than it can chew, when the political as well as the economic difficulties in the way are considered. This remains to be proven, but it is plain that we have undertaken a very difficult task in attempting to stabilize commodity values; and that if we are to succeed we will have to adopt measures that are more radical than any that have thus far been undertaken.

This is the narrow and nearer view of our own little economic world. That the problem of price-fixing and price-maintenance will be solved no one doubts. The solution may not come as we expected, and it may be longer in coming than many now anticipate. For these reasons there are some who fear that those who are speculating in stocks and commodities will grow weary and sell out.

There is, however, another phase of the situation which transcends the comparatively unimportant question of prices. That question will settle itself automatically if natural law is left to work itself out, but the Naval Arms Conference in London and the issues under consideration there will not settle themselves naturally unless those who are struggling for peace have the aid of civilization in the efforts they are making to promote the happiness and welfare of generations that are yet unborn.

The Conference is, therefore, to be placed ahead of the price problem in our consideration of the week's developments. The conferees seem to be working slowly, but there is reason to hope that they are progressing, and with all due respect to cotton "bulls" and "bears," their progress means more to the world than an advance of five or even ten cents a pound in the value of the world's cotton production.

We can adjust ourselves to a change in prices. We cannot adjust ourselves, except by self-destruction, to the constant possibility of another world war.

For the same reason the London Naval Arms Conference is of more importance than the price problem in an economic sense. It won't take us long to cut or increase production, as the law of supply and demand may dictate, but to be prepared for war at all times will sap the energies and resources of the world, and make us a nation of paupers without a poor house to protect us.

Aside from these two great questions there has not been much of special or unusual interest in the week's news. Silver has been drooping again, but the confidence of the Far East in its value seems to persist, and the best judges do not look for any further decline at present. In the event of lower prices production will, of course, be reduced, and the position of the white metal cannot be any longer regarded as a menace to the world's finance.

The steel business in the United States has shown a surprising expansion of activity. It is said to be due chiefly to the buying of the automobile manufacturers, but there is a good deal of new building that calls for much structural steel, a great many railroads are laying tracks, and a vast amount of electrical construction in which steel will be required. The demand from these three quarters is enormous, and although it slowed down a little last week it is believed that the industry will be pretty well employed during the summer.

The automobile manufacturers are holding their recent gains, but no further increase in output is expected until they see how spring sales go, and perhaps the same spirit of hopeful caution describes the attitude of business men generally.

A slight improvement in the cotton-textile industry is also to be noted, and some woolen manufacturers grudgingly admit that the market for woolen and worsted cloths is improving.

The very high price of copper continues to be a menace to the situation, and unless history is misleading, it will be difficult to maintain it.

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From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page

SPOTTINESS is still the principal characteristic of the machinery and machine-tool business throughout the country. The unusual flow of inquiries continues unabated; though sales during February are generally conceded to be better than those during January, the market is still not all it should be. The same tendency to procrastinate placing orders, which has been in evidence for the past two months, is still clogging the wheels.

CLEVELAND business is marking time, with steel mills and steel fabricators the latest to enter the lists of inquirers. Some New York dealers are having exceptional business, but the majority are hoping that the recent railroad lists and other inquiries will bear a little fruit for them. Chicago dealers are expecting March to bring the flood of orders expected in February. Foreign prospects are good in New England, but most other business is of the one-two variety. Philadelphia sales are to woodworking, marine, and railroad interests.

MILWAUKEE reports a better situation, with a number of industries showing interest. Buffalo is optimistic, but sales so far have been few. Detroit dealers are making steady gains and some fairly large orders are coming in. Cincinnati business is fair, orders being for single units. The used-tool market in all sections is also spotty and unsettled.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine-tool business

THE following reports, gathered from the various machinery and machine-tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

CLEVELAND

Business in the local machine-tool market remains unchanged from the condition that has existed for the past three weeks. The industry is marking time without any unusual happenings. New orders are being received but they are mostly for replacement purposes from a diversified list of users. Inquiries are on the increase, however, and to some it appears as if better business is just around the corner. Steel mills and steel fabricators in the Youngstown and Pittsburgh district have issued recent lists.

An exception to the general rule of quietness is the substantial gain in sales made by a turret lathe manufacturer during the past two weeks. Another division to show increased activity is road machinery.

NEW YORK

Conditions in the New York machinery and machine-tool market may best be described as spotty, for though the general run of dealers seem to be in the same condition as they have been for several weeks past, a dealer here and there reports an exceptional week's business, one reporting a month about as good as any last year. The U. S. Mail is still collecting on the unusual number of inquiries, and it looks as though it will continue to do so. Outstanding inquiries are few, those of the N.Y.C. and the D.L.&W. railroads being the only unusual ones in the past two weeks.

Sales are for single items, some large, but the majority small. Dealers are divided in their opinion of the future of the market, some predicting better conditions imminent, some placing the break several months from now. All, however, express the convictiion that things will continue to improve and are decidedly optimistic.

CHICAGO

Machine-tool market conditions are not showing as much improvement as had been hoped for. Thus far in February the volume of sales booked has been rather disappointing. The records show a gain over those in January, but the majority of distributors and dealers state that little improvement has been noted if any. March is now looked forward to for the closing of a number of sales which have been hanging fire for several weeks. Notwithstanding these unsatisfactory conditions a feeling of optimism with respect to spring business prevails. This is accounted for by the number of inquiries being received from day to day. Railroad inquiry continues to lead, and a number of sales of important shop tools are reported as having been closed within the last few days. The International Harvester Co. has been buying against a few items for which inquiries have been out for some weeks. Such plants as are dependent on the automotive and auto accessory industries are counting on increased production activity in the near future to bring their sales up to a good average. Demand for used tools is slowing up somewhat.

NEW ENGLAND

Developments during the week gave definite assurance that machine-tool distribution has increased in February. This upward trend has been gradual, and for New England as a whole, business is spotty. Two dealers in used equipment reported strong sales and brighter prospects during the week. Orders for new machines are of the one-two variety, but are representative of a good number of industries. In most centers foreign prospects run high. Operations in most plants are steady with shipments at a high level.

Inquiries for the week give an optimistic outlook to the situation. In fact, prospective orders on which companies have quoted since the first of the year are representative of a good level of new business, if only a comparatively small percentage should develop into orders.

Municipal buying of manual training equipment is promising in many sections.

PHILADELPHIA

Business in the machinery and machine-tool market in Philadelphia was somewhat spotty during the last two weeks, with buying rather cautious in most lines. The opinion prevailed that the present volume is considerably behind what it was at this time last year.

The belief prevails, however, that the present situation will clear up, and some substantial orders will come from the profuse inquiries. Some orders have come from furniture manufacturers in upper New York and New England for woodworking machinery and there have been some sales of machine tools. Some marine equipment has been sold to shipyards in this territory, and some small purchases from the railroads were noted. The carriers, however, have not been in the market for any extensive buying from this territory during the past fortnight. Small tool manufacturers reported some rather brisk buying from smaller plants.

MILWAUKEE

The situation in the metal-working industry is assuming a brighter aspect, although there still is apparent a tendency on the part of buyers in some lines to defer purchases until the need becomes more pressing. The demand from the automobile industry is showing some signs of a revival, but so far it has been a particularly weak spot in the total volume of new business booked. The most active demand and inquiry is from manufacturers of agricultural machinery, road building and maintenance equipment, tractors, prime movers, and general industrialists. Prominent in the market are the Allis-Chalmers Manufacturing Co., the A. O. Smith Corporation, the Oilgear Co., International Harvester Co., and the Milwaukee Road. The last-named interest has requirements of considerable importance still to meet in the equipping of its new car shop at this point.

The employment situation continues rather spotty in the metal trades industry. A majority of shops, while adding a few to the payroll from day to day, are still well under last year's peak. On the other hand, Allis-Chalmers at the middle of the month was employing more men than at any time in 1929, which is, of course, exceptional.

General business sentiment is growing more cheerful as the effect of the financial readjustment wears off. While the public is still hesitant in its purchases, there is apparent a resolute attitude on the part of manufacturers and dealers which is refreshing to those viewing the situation as a whole, as distinguished from provincial analysis.

BUFFALO

While some machine-tool dealers of Buffalo feel that February will not be more than equal to January in the volume of business, the feeling is generally more optimistic than it was two weeks ago. Orders placed are small, and have emanated from comparatively small industries.

Practically the same thing may be said of the electrical equipment trade. Inquiries are not what they should be to produce a good business next month and the present volume is far below what it was a year ago when business was approaching the peak of the boom. The feeling now seems to be that, once the first quarter of the year is over, there will be a real resumption of business.

Demand for contractors' equipment is good. This applies both to road-building equipment and the general contracting field.

DETROIT

Business conditions in Detroit seem to be improving more slowly than in other sections of the country but some noticeable gains have been made in the machinery and machine-tool trade within the past two weeks. These gains have been steady since the latter part of January and there seems no likelihood of a recession in the near future.

Several fairly large orders have been reported within the past ten days. One dealer has sold a number of diamond boring machines and expects to close another good-sized order soon. Other dealers report a general improvement of business with indications that more rapid gains are in store. A number of automobile plants have been making widespread changes in motor design and one new plant is being established for the manufacture of a foreign car in this country. All of the machinery for this plant, or nearly all of it, is being purchased in Michigan.

CINCINNATI

In the past week a number of machine-tool manufacturers of the Cincinnati district had a slight increase in sales. The majority, however, characterized the business in the period as "fair," with no material change from the previous week. The retarding feature is not the absence of need of tools, but it is the general tendency to postpone the making of commitments.

Manufacturers of very large tools, who gage their business by the month, rather than by the week, state that the indications are that February will show some gain over the previous month and express the opinion that the closing of business now pending will enable them to make a much better showing in March.

By far the greater portion of the week's business was made up of orders for single tools and replacements, but here and there the purchaser's requirements were two or three items. The principal buyers were general machinists and miscellaneous users, and the orders were well diversified as to sizes and types of tools. Several orders were received from makers of automobiles and accessories, but all of these were small.

Business Items

The Atwater Manufacturing Co., Southington, Conn., has been merged with the Tubular Products Co., also of Southington, the transaction involving $500,000. Alfred M. Smith, president of the Atwater company, will be chairman of the board of directors. Benjamin S. Munch, president of the Tubular Products Co. will head the company. The Board will compose B. S. Munch, Alfred M. Smith, Herman Isenburg, A. S. Borden, James H. Pratt, and Edwin S. Todd.

An all-steel foundry building is being constructed for the American Brake Shoe & Foundry Co., of California upon a 3-acre site at Maywood, Calif. According to present plans the plant will be 135 to 180 ft. long, with a craneway 209 ft. long, 70-ft. span, 35 ft. high, and equipped with an electro-magnet to handle raw materials. The full capacity of the plant will be approximately 40 tons of finished railway brake shoes per day. The plant will cost approximately $100,000 and will be ready for occupancy the latter part of this month.

The Jeffrey Manufacturing Co., Cleveland, has acquired the Bakstad Crusher & Equipment Corporation, Chicago. The Bakstad 3-jaw crusher will now be manufactured by the Jeffrey company and its sale in Canada handled by the Jeffrey Manufacturing Co., Ltd. A. R. Bakstad has been appointed manager of sales in the crusher and pulverizing division of the Jeffrey company and C. P. Puhl, on the Bakstad sales staff, will handle sales of the Jeffrey-Bakstad units.

The Kellman Manufacturing Co., has been established in Sycamore, Ill., and organized with $150,000 capital, occupying the large Illinois Thresher plant in Sycamore. Frank B. Watson, chairman of the board, Aurora First National bank, is president, and Judge John K. Newhall is secretary-treasurer. Carl K. Kellman, is vice-president and in charge of the plant. S. G. Kalley, for the past five years associated with Mr. Kellman in the Marlow-Kellman corporation at Sycamore, is sales manager.

The McKiernan-Terry Drill Co., New York City, has changed its corporate name to McKiernan-Terry Corporation and acquired the National Hoisting Engine Co., Harrison, N. J., and Steel & Condict, Inc., Jersey City. Both will operate as divisions of the McKiernan-Terry Corporation with executive activities transferred to the sales offices of the corporation in New York. Work will be divided between the McKiernan-Terry plant at Dover, N. J., and the National Hoisting Engine plant at Harrison. Both plants have been substantially enlarged.

The Sivyer Steel Casting Co. and the Nugent Steel Castings Co., Milwaukee, have consolidated. The combined organizations will operate under the name of the former company with home offices in Milwaukee. Lamar S. Peregoy, formerly vice-president of the Sivyer company, is expected to become president, and C. R. Messinger, former president, chairman of the board.

Aluminum Industries, Inc., Cincinnati, has completed expansion plans to increase plant capacity and has let contracts for two buildings, a permanent mold foundry and a machine shop. The building, of saw tooth construction, will cost approximately $100,000 and will add 30,000 sq.ft. of floor space at the Beekman St. factory.

The Detroit (Mich.) Steel Products Co. has announced the opening of a factory branch at Seattle, Wash., in charge of O. C. Hendry, who formerly was with the Detroit Steel Products factory in Oakland, Calif., and has been with the company since 1922.

The Paragon Machine Tool & Die Works, Oakland, Calif., recently purchased 14,000 sq.ft. of floor space, and will manufacture dies, surgical instruments, gasoline pumps, gasoline meters, grease meters and washing machines. Officers are: president, L. W. Evans; vice-president, A. de Soto; and Secretary, B. Belazs. A sales office will be maintained in San Francisco.

The Pittsburgh Brass Manufacturing Co. has been taken over by H. F. Brennan, O. W. Oppenheimer, and A. M. Oppenheimer of Pittsburgh, and W. P. Todd of New Bethlehem, Pa., who will continue the business under the same name. Mr. Brennan is president, Mr. Todd is secretary and treasurer, and O. W. Oppenheimer is vice-president.

Transfer of operations of the Golden Eagle Aircraft Corporation from Inglewood, Calif., to Columbus, Ohio, has been announced by R. O. Bone, president. Equipment and all planes in process of construction have already been transferred to the new factory.

The Cullen Co., Clinton, Iowa., has purchased the Mississippi Valley Stove Works, Fulton, Ill., across the river, and will move its plant there this spring, J. T. Cullen, Jr., secretary, announced last week. The transfer however will not be made until another industry, which is negotiating for the Cullen plant in Clinton is ready to occupy the factory. J. T. Cullen, Sr., is president, and K. M. Cullen, vice-president.

The Chicago Bridge & Iron Co., with plants at Chicago and Greenville, Pa., has purchased the Reeves Brothers Co., 1506 N. Fiftieth St., Birmingham, Ala., for approximately $600,000. E. E. Michaels, formerly assistant manager of operations at Chicago, has been appointed manager of the Birmingham plant, while practically the entire local organization will be retained.

The Geometric Tool Co., New Haven, Conn., is opening a new office at Room 315B, Stormfeltz-Lovely Bldg., Woodward Ave. at Grand Blvd., Detroit. Stock will be carried there for distribution. The Charles A. Strelinger Co. will continue to sell threading machines and chaser grinders there also.

Personals

NATHANIEL K. B. PATCH, secretary of the Lumen Bearing Co., Buffalo, has been nominated for president of the American Foundrymen's association.

Mr. Patch has been active in work of the association for many years and has held important offices, including that of vice-president. E. H. Ballard, foundry and pattern shop superintendent of the General Electric Co., Lynn (Mass.) works, was nominated for vice-president. C. S. Anderson, vice-president and general manager, Belle City Malleable Iron Co.; H. R. Culling, vice-president, Carondelet Foundry Co.; Fred Erb, president, Erb-Joyce Foundry Co.; R. M. Maull, treasurer, Tabor Manufacturing Co.; and D. M. Scott, vice-president, Gould Coupler Co., and Symington Co., were nominated for directors.

JOHN B. HENRECHON has rendered good and faithful service to the Pratt & Whitney Co., Hartford, Conn., for half a century. He paused long enough on

his fiftieth employment anniversary to receive the honors and good wishes of his employers and fellow workmen. C. R. BURT, vice-president of the company, presented Mr. Henrechon with a basket of flowers as a symbol of the appreciation of the company.

DR. JAMES ASTON, director of mining and metallurgy at the Carnegie Institute of Technology and consulting metallurgist of the A. M. Byers Co., Pittsburgh,

has received the Robert W. Hunt medal of the A.I.M.E. for his paper on "A New Development in Wrought Iron Manufacture." The presentation was made at the annual dinner of the organization at the Commodore Hotel, New York, on Feb. 19. Dr. Aston's method for quantity production of wrought iron is known commercially as Byers' New Process.

COLLINS P. BLISS, associate dean of the College of Engineering of New York University, has been elevated to the deanship. Dean Bliss is chairman of the A.S.M.E. sectional committee on pipe flanges.

ALBERT C. BRUCE, formerly chairman of the board of the U. S. Hoffman Machinery Corporation, Chicago, has been elected president to succeed HERBERT W. STONE, resigned. GEORGE E. BOWDOIN was elected vice-president and WAYNE MENDELL, general sales manager, was elected vice-president in charge of sales.

FRANK J. BURD has been appointed manager of the Philadelphia office of Cutler-Hammer, Inc., Milwaukee. Mr. Burd replaces T. E. BEDDOE, resigned.

DIETRICH HEYEN has been appointed secretary and H. M. HEFFERNAN purchasing agent of the Woodhaven Metal Stamping Co., Inc., Brooklyn.

E. KENT HUBBARD, president of the Manufacturers' Association of Connecticut, Inc., sailed Feb. 15 on the S.S. *Saturnia* to make a special investigation of market conditions in Europe.

DR. IRVING LANGMUIR, Schenectady, N. Y., whose many research discoveries in engineering, electricity, and chemistry have had fundamental results on industry, will receive the Willard Gibbs gold medal of the Chicago section of the American Chemical Society. Presentation will be made at the annual dinner on May 24.

FREDERICK A. SCHMIDT, who has contributed a number of items to *American Machinist*, machinery buyer and industrial engineer for the Western Electric Co., Kearney Works, has become affiliated with the Plainfield (N. J.) Manufacturing Company.

GEORGE H. CLYMER has been appointed Philadelphia district sales manager of the Wrought Iron Co. of America, Lebanon, Pa. He succeeds the late Albert P. Loesch.

B. W. WOLFE, assistant vice-president in charge of foreign operations, and F. A. COLEMAN, foundry expert, of the Austin Co., Cleveland, sailed on Feb. 15 for Russia to supervise preliminary work on the $40,000,000 automobile plant and industrial city the company is designing and building for the Soviet government at Nizhni Novogorod.

GEORGE P. TORRENCE, vice-president and manager of the Link-Belt plants in Indianapolis, was recently elected first vice-president of the Associated Employers of Indianapolis. The machinery, iron and steel industries were well represented on the newly elected board of directors, including O. B. ILES, head of the International Machine Tool Co.; GUY A. WAINWRIGHT, Diamond Chain Co.; J. S. HOLLIDAY, Holliday Iron Co.; ROY E. ADAMS, J. D. Adams Co.

CARL F. MAYER, for the past 10 years manager of the oven department, Swartwout Co., Cleveland, recently purchased by the Foundry Equipment Co., has been elected second vice-president.

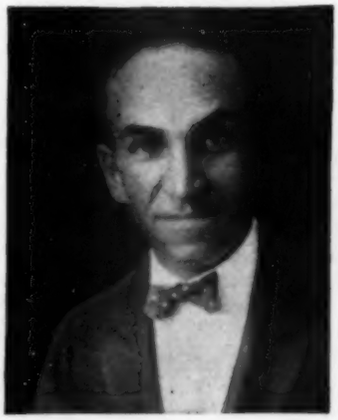
Obituaries

HARRY AINSWORTH, president of Williams, White & Co., Moline, Ill., for the past 16 years, died in Iowa City on Feb. 6 after a short illness. Mr. Ainsworth had been connected with the

metal-working industries since 1887. Mr. Ainsworth also organized the Moline Forge, Inc., and built the plant in that city for forging specialties.

ALBERT WARNER PRIEST, 82, president of the Hayton Pump & Blower Co., and the Eagle Manufacturing Co., Appleton, Wis., died recently at his home there. He was also president of the Green Bay (Wis.) Wire Works, and a director of the Four-Wheel Drive Auto Co., Clintonville, Wisconsin.

FRANK G. HOFFMAN, sales manager of the Machine and Small Tool divi-



sions of Barber-Colman Co., Rockford, Ill., died on Feb. 10 at his home in that city. He was stricken with an acute heart attack without warning while he was preparing to leave for a business trip to St. Louis.

COL. WILLIAM TURNBULL, 56, chief mechanical engineer for the Caterpiller Tractor Co., Peoria, Ill., and during the World war a member of the U. S. army ordnance advisory board, died on Feb. 10 there following an illness of a week.

HARRY L. CANNER, 47, president of the Canner Engineering Co., New York, was killed in an automobile accident in Brooklyn on Feb. 11. He was formerly chief engineer of the Sperry Gyroscope Co. and had also been connected with the General Electric Company.

ADELBERT E. COLEMAN, 71, manufacturer of ornamental iron and bronze, died on Feb. 13 at his home in Chicago. He was the founder of the Chicago Ornamental Iron Company in 1893, which for the past 15 years has operated under his own name.

Forthcoming Meetings

NATIONAL MANAGEMENT CONGRESS —Stevens Hotel, Chicago, March 3 to 5. National Industrial Equipment Exposition in connection, March 3 to 7. G. E. Pfisterer, 308 W. Washington

AMERICAN SOCIETY OF MECHANICAL ENGINEERS — National Materials Handling meeting, March 5-7, Stevens Hotel, Chicago. Calvin W. Rice, 29 W. 39th St., New York City, is secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Fiftieth Anniversary celebration. Opens in New York, April 5, afternoon in Hoboken; April 6 in New York; April 7, 8, and 9 in Washington, D. C., at the Mayflower Hotel. Calvin W. Rice, 29 West 39th St., New York City, secretary.

AMERICAN FOUNDRYMEN'S ASSOCIATION — Annual Convention, Cleveland Public Auditorium, Cleveland, Ohio, May 12-17. C. E. Hoyt, 222 W. Adams St., Chicago, is secretary-treasurer.

SOCIETY OF AUTOMOTIVE ENGINEERS —1930 Summer Meeting, French Lick Springs Hotel, French Lick Springs, Ind., May 25-29. National headquarters are at the Engineering Societies Bldg., 29 W. 39th St., New York City.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS — Semi-annual meeting, Hotel Book-Cadillac, Detroit, June 2 to 12. Calvin W. Rice, 29 West 39th St., New York City, is secretary.

NATIONAL ASSOCIATION OF FOREMEN —Convention at Toledo, Ohio, June 6-7. Harry J. Baumker, 316 Tenth St., Toledo, is convention secretary.

STEEL INDUSTRY'S EXECUTIVES—Annual Iron & Steel Exposition. Under the sponsorship of the Iron & Steel Electrical Engineers, June 16-20, Broadway Auditorium, Buffalo, N. Y. John F. Kelly, 1010 Empire Bldg., Pittsburgh, Pa., is managing director.

AMERICAN SOCIETY FOR TESTING MATERIALS—Annual meeting, Haddon Hall, Atlantic City, N. J. June 23-27. C. L. Warwick, 1315 Spruce Street, Philadelphia, is secretary-treasurer.

THE WEEKLY PRICE GUIDE . . .

Rise and Fall of the Market

THE present high rate of steel ingot production is serving largely to replenish reserve stocks of semi-finished material, while finished products continue to move slowly with the exception of fabricated structurals. The price movement in non-ferrous shop materials is at present downward, affecting zinc, solder, babbitt metal and linseed oil. Tin, as an exception, is about ¼c. per lb. higher this week, at New York warehouses.

(All prices as of Feb. 21, 1930)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$17.69@$18.19
Northern Basic	19.90
Southern Ohio No. 2	19.90
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	19.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	15.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76@22.26
Virginia No. 2	24.04
Basic	19.75@20.25
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	20.01
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	20.26
Basic	20.26
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10	3.35	3.30	3.90†
No. 12	2.15	3.45	3.35	3.95†
No. 14	2.25	3.55	3.45	4.00†
No. 16	2.35	3.65	3.55	4.10†
Black				
Nos. 18 to 20	2.35@2.55	3.85	3.55	3.70
No. 22	2.50@2.70	4.00	3.70	3.85
No. 24	2.55@2.75	4.05	3.75	3.90
No. 26	2.65@2.85	4.15	3.85	4.00
No. 28	2.80@3.00	4.75	4.00	4.15
Galvanized				
No. 10	2.60	3.90	3.80	3.80
Nos. 12 to 14	2.70	4.00	3.90	3.90
No. 16	2.80	4.10	4.00	4.00
No. 18	2.95	4.25	4.15	4.15
No. 20	3.10	4.40	4.30	4.30
No. 22	3.15	4.45	4.35	4.35*
No. 24	3.30	4.60	4.50	4.50
No. 26	3.55	4.85	4.75	4.75
No. 28	3.80	5.10	5.00	5.00

*Light plates. †Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. butt	53.74%	41.2%	55.5%	43.5%	55.5%	42.5%
3½ to 6 in. lap	50.32%	37.78%	53.5%	40.5%	51.6%	39.0%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28
8	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb:

Thickness—B.w.g. and Decimal Fractions		Outside Diameter in Inches—Price per Foot ¼	⅜	½	⅝	1	1¼	1½
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00
Cold drawn, round or hexagon‡	3.40	3.65	3.60
Cold drawn, flat or square‡	3.90	4.15	4.10
Structural shapes	3.30†	3.00	3.10
Soft steel bars	3.25†	3.00	3.00
Soft steel bar shapes	3.25†	3.00	3.00
Soft steel bands	3.75†	3.65	3.65
Tank plates	3.30†	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$-in. thick. †Up to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse— $\frac{3}{32}$, 8.35c. per lb.; $\frac{1}{8}$, 7.85c. per lb.; $\frac{5}{32}$ to $\frac{1}{4}$, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			19.25
Tin, Straits, pigs, New York			40.25@41.25
Lead, pigs, E. St. Louis	6.10	New York	7.00@ 7.50
Zinc, slabs, E. St. Louis	5.15	New York	6.50@ 7.50

	New York	Cleveland	Chicago
Antimony, slabs	10.50@11.00	11.50	14.50
Copper sheets, base	27.75	27.75	27.75
Copper wire, base	20.12½	20.12½	20.12½
Copper, drawn, round, base	26.25	26.25	26.25
Copper tubing, base	29.25	29.25	29.25
Brass sheets, high, base	23.25	23.25	23.25
Brass tubing, high, base	28.25	28.25	28.25
Brass rods, high, base	21.25	21.25	21.25
Brass wire, high, base	23.75	23.75	23.75

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25@26	24.30	24.30
Zinc sheets (casks).....	10.50@12.00	12.25	10.11
Solder (½ and ½).....	29.25	29.75	28@30
Babbitt metal, delivered in case lots, New York, cents per lb:			
Genuine, highest grade.....			57.00
Commercial genuine, intermediate grade.....			42.00
Anti-friction metal, general service.....			31.00
No. 4 babbitt, f.o.b.....			11.50

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold drawn.....	53.00	40.00
Tubing.....	75.00*	90.00†
Angles, hot rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper.....	14.50 @15.00	13.50	13.00 @13.50
Copper, heavy, and wire..	13.50 @14.00	13.00	12.25 @12.75
Copper, light, and bottoms	12.00 @12.25	12.00	11.25 @11.75
Heavy lead.....	4.50 @ 5.00	5.25	4.25 @ 4.75
Tea lead.....	2.87½@ 3.12½	3.25	3.25 @ 3.75
Brass, heavy, yellow.....	7.75 @ 8.00	8.00	7.25 @ 7.75
Brass, heavy, red.....	11.25 @11.75	12.50	10.25 @10.75
Brass, light.....	6.25 @ 6.75	7.00	6.25 @ 6.75
No. 1 rod-brass turnings..	9.00 @ 9.25	8.00	7.75 @ 8.25
Zinc.....	2.50 @ 2.75	3.00	2.00 @ 2.50

TIN PLATES—Charcoal—Bright—Per box:

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb..	$0.13*	$0.16	$0.15
Cotton waste, colored, per lb..	.09½*	.12	.12
Wiping cloths, washed, white, per lb.....	.12½	38.00 per M	.16
Sal soda, per lb.....	.02½	.02	.02
Roll sulphur, per lb.....	.028	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.148	.164	.152
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.65	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal..	.33	.36	.24
Belting — Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin. ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt..	30%	30– 5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

*Grade F.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb..	$0.0325	$0.0325	$0.0325
Cold drawn shafting...	per lb..	.034	.035	.035
Brass rods.....	per lb..	.2125	.2125	.2025
Solder (½ and ½).....	per lb..	.2925	.295	.345
Cotton waste, white...	per lb..	.13	.13	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1, 6-in. dia.....	per 100.	4.59	4.59	3.59
Lard cutting oil.....	per gal.	.65	.65	.65
Machine oil.....	per gal.	.33	.33	.30
Belting, leather, medium.....	off list..	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs...	off list..	50-10%*	50–10%*	50–10%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*.....	$6.03	$6.03	$6.03
Emery cloth*.....	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†.....	2.61	2.61	2.61
Cloth†.....	4.59	4.59	4.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton.....		Connellsville,	2.60
Coke, prompt foundry, per net ton.....		Connellsville,	3.50@4.85
White lead, dry.....	100 lb. kegs....	New York,	13.75
White lead, in oil.....	100 lb. kegs....	New York,	14.25
Red lead, dry.....	100 lb. kegs....	New York,	13.75
Red lead, in oil.....	100 lb. kegs....	New York,	15.25

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	60%
Larger, up to 1 x 30-in., full kegs, list less.....	50–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws:	
Up to ½-in. x 6-in., list less.....	60%
Larger, list less.....	50–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, 7/16-in. dia. and smaller, list less.....	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	60%
Larger, up to 3-in., list less.....	40–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20%
Without stub ends, list less.....	50%
Chain:	
Proof coil, base, per 100 lb., net.....	$8.50
Cast iron welding flux, per lb., net.....	.35
Brazing flux, per lb., net.....	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Calif., Guadalupe—Guadalupe Joint Union School District, F. V. Pitts, Clk.—machinery and equipment for proposed manual training building. Bids on construction to be taken Mar. 4.

Mass., Mattapan (Boston P. O.)—Owner, 220 Woos Ave.—power band saw, heavy frame.

Mass., Westfield—Westfield Boys' Trade School —manuel training equipment for proposed 2 story school. Estimated cost $75,000.

Mo., Fenton—H. Ludwig—blacksmith's portable forge to be operated by electric motor.

O., Middletown—Bevis Machine Co., G. Bevis, Mgr.—machinery and equipment including lathes, metal working machines, drill press, etc. for new shop.

Tex., San Antonio—San Antonio Machine & Supply Co., 325 North Center St.—machinery and equipment (later) for proposed 2 story addition to machine plant.

Ont., Sandwich—Sandwich Foundry Co.—foundry equipment for proposed 1 story plant on Chippewa St. to replace fire loss. Estimated cost $155,000.

An English concern, through an American firm, asks for literature and prices f.o.b. steamer at New York on a vertical double boring machine for boring steel castings with cored holes 3½ in. diameter out to 4 in., fast and accurately. Tables 18 x 20 in. diameter. Send data in triplicate, including gross weight and cubic dimensions, to A. W. Welch, Business News Dept., American Machinist, Tenth Ave. at 36th St., New York.

Opportunities for Future Business

Ala., Gadsden—Gulf State Steel Co., W. H. Coverdale, Pres., Brown-Marx Bldg., Birmingham, plans to expend between $17,000,000 and $20,000,000 for new mills and additions to plant here including blooming mill, $1,000,000; plate mill, $2,000,000; sheet mill, $2,000,000; four open-hearth steel furnaces, 27 by-product coke ovens, 5,000 ton blast furnace, etc. Work under way on blooming mill and sheet mill.

Calif., Los Angeles—Bucklein Engineering & Supply Co., 336 South San Pedro St., awarded contract for the construction of a 1 and 2 story, 75 x 80 ft. factory.

Calif., Los Angeles — Grand Rapids Store Equipment Corp., c/o G. W. Davis, Fine Arts Bldg., plans the construction of a factory. Estimated cost $500,000.

Calif., Oakland—Standard Creamery Co., 2443 San Pablo Ave., awarded contract for the construction of a machine shop at Market and Alicia Sts.

Calif., Pomona—Pomona Pump Co., is having plans prepared for the construction of a group of factory buildings, 1, 2 and 3 story. Private plans.

Calif., Sacramento—Pacific Telephone & Telegraph Co., Pacific Telephone and Telegraph Bldg., San Francisco, awarded contract for the construction of a 1 story garage. Estimated cost $153,470.

Calif., San Diego—Bureau of Yards & Docks, Navy Dept., Washington, D. C., awarded contract for extension to erection shop and battery and metal shop at Naval Operating Base here. Noted Feb. 20.

Calif., San Francisco—U. S. Government, Washington, D. C., awarded contract for the construction of a warehouse and shops at Goat Island here. Estimated cost $65,400.

Calif., Stockton—Gulf Red Cedar Co., manufacturers of pencil slats and other cedar products, plans addition to factory.

Conn., New Haven—Brock Hall Dairy Co., Inc., 1204 Whitney Ave., awarded contract for the construction of a 2 story, 70 x 115 ft. garage on Whitney Ave. Estimated cost $60,000. Noted Feb. 13.

Fla., Jacksonville—Burwell Motor Co., B. Burwell, Jr., Pres., 924 Laura St., awarded contract for a 2 story, 100 x 144 ft. addition to plant. Estimated cost $50,000.

Ill., Chicago—B. H. Bunn Co., 7329 Vincennes Ave., manufacturers of package tying machines, awarded contract for the construction of a 1 story, 60 x 100 ft. factory at 7604-8 Yale Ave. Estimated cost $22,000.

Ill., Chicago—United Autographic Register Co., 2316 West 43rd St., awarded contract for masonary, carpentry, etc. for a 2 story 207 x 362 ft. factory at California Ave. and 50th St. Estimated cost $1,000,000. Noted Dec. 19.

Ind., Evansville—J. W. Watton, 3 South 4th St., awarded contract for the construction of a machine shop and garage at Market and Bond Sts. Estimated cost $41,000. Private plans.

Ind., Indianapolis—Spuhr Realty Co., awarded contract for the construction of a machine shop, etc. at Kentucky Ave. and Morris St. Estimated cost $150,000.

Ky., Louisville—Louisville Taxicab & Transfer Co., 9th and Liberty Sts., plans the construction of a 2 or 3 story, 105 x 105 ft. garage, office, etc. Estimated cost $125,000. D. X. Murphey & Bro., Louisville Trust Bldg., Archts.

La., Slidell—Canulette Shipbuilding Co., plans a 40 x 200 ft. machine shop. Estimated cost $15,000.

Mass., Attleboro—L. G. Balfour Co., County St., manufacturing jewelers awarded contract for section 1 of factory, also plans section 2, 1 and 3 story, 40 x 60 and 40 x 350 ft. Estimated cost $40,000 and $150,000 respectively.

Mass., Boston—Boylston St. Land Co., 89 Broad St., awarded contract for the construction of a 1 story repair and service garage. Estimated cost $50,000.

Miss., Corinth—National Airways System, Peoria, Ill., S. F. Tannus, Pres., option on site for the construction of an airport including hangar, machine shop, etc. here.

N. J., Bordentown—State Bd. of Education, Trenton, will soon award contract for the construction of a 2 story, 120 x 175 ft. building for manual training for colored youth, here. Estimated cost $150,000. Culbert & Betelle, 20 Branford Pl., Newark, Archts.

N. J., Irvington — Bd. of Education, 1253 Clinton Ave., is having revised plans prepared for the construction of a 3 story school including woodworking shop, etc. at Berkeley Terrace. Estimated cost $1,000,000. V. H. Strombach, 1243 Springfield Ave., Archt.

N. J., Newark—General Alloy Co., 188 New Jersey Railroad Ave., is having preliminary plans prepared for the construction of a 2 story factory on Maple Pl. Estimated cost $40,000. P. B. West, 24 Commerce St., Archt.

N. J., North Bergen—G. Willaredt, 411 23rd St., West New York, Archt., will receive bids about Mar. 1 for a 3 story addition to factory at 3923-47 Hudson Blvd. for Theurer Wagon Works Inc., 3923 Hudson Blvd., North Bergen. Estimated cost $40,000. Noted Feb. 13.

N. Y., Brooklyn—Albermarle Heights Building Corp., 32 Court St., plans the construction of a 1 story, 125 x 231 ft. garage at Gravesend and Ditmas Aves. Estimated cost $50,000. W. F. Doyle, 11 John St., New York, Archt. Noted Feb. 20.

N. Y., Brooklyn—C. Bender and J. F. McGovern, 299 Prospect Ave., W., plan the construction of a shop, gas station, etc. at Ashland Pl. and DeKalb Ave. Estimated cost $40,000. A. A. Blaustein, 1102 Kings Highway, Archt.

N. Y., Brooklyn—Cameo Holding Corp., 50 Court St., plans the construction of an 83 x 100 ft. garage at Warwick St. and New Lots Ave. Estimated cost $65,000. J. J. Millman, 26 Court St., Archt.

N. Y., Brooklyn—J. M. Halleren, 2191 Nostrand Ave., plans the construction of a 100 x 168 ft. garage at Nostrand Ave. and Ave. H. Estimated cost $75,000. Seelig & Finkelstein, 153 Pierrepont St., Archts.

N. Y., Brooklyn—P. Hitlin, 16 Court St., is receiving bids for the construction of a 5 story garage at 94 Orange St. Estimated cost $150,000. Slee & Bryson, 160 Montague St., Archts. Noted Nov. 28.

N. Y., Brooklyn—Queens Developers, 1325 Eastern Parkway, is receiving bids for the construction of a garage at Dahlia and Crommelin Aves. Estimated cost $40,000. Farber & Kaiken, 1746 Pitkin Ave., Archts.

N. Y., Buffalo—Niagara Machine & Tool Works, 637 Northland Ave., plans addition to plant. Estimated cost to exceed $40,000. H. E. Plumer, 775 Main St., Archt.

N. Y., New York—Fifth Ave. Coach Co., 605 West 132nd St., plans the construction of a 2 story bus terminal, gasoline storage building, garage, etc. at 58 West 37th St. Estimated cost, $50,000. Private plans.

N. Y., Jamaica—Robert Weismantel, 139-13 Hillside Ave., will receive bids after June 1 for the construction of a garage at 130th St. and 89th Ave. Estimated cost $40,000. H. Erdt, c/o owner, Archt.

N. Y., New York—Ground Realty Corp., 73 Worth St., will receive bids after April 15 for the construction of a garage at 240 Nagle St. Estimated cost $60,000. M. J. Ort, 424 East 149th St., Archt. Noted Nov. 14.

N. Y., New York—A. T. Mannon, c/o G. J. O'Reilly, 11 East 44th St., Archt., plans the construction of a garage at 318 East 48th St. Estimated cost $150,000.

N. Y., New York—Riebach Realty Corp., c/o H. Ginsberg, 205 East 42nd St., Archt. awarded contract for a 5 story, 75 x 100 ft. garage at 329 East 21st St. Estimated cost $150,000. Noted Dec. 26.

O., Cincinnati—Lockwood Mfg. Co., 650 West 3rd St., awarded contract for a 2 story, 231 x 280 ft. factory for the manufacture of bakery pans and equipment on Wasson Rd. Estimated cost $150,000. Noted Feb. 20.

O., Cleveland—H. O. Taylor, 243 South Dearborn St., Chicago, Ill., Archt. and Engr., will soon receive bids for a 3 story, 80 x 200 ft. addition to factory at East 110th St. and Harvard Ave. for Kroehler Mfg. Co., 1644 Doan St., Cleveland. Estimated cost $200,000. Noted Feb. 13.

O., Toledo—Toledo Scale Co., Monroe St., awarded contract for the construction of a factory on Telegraph Rd. Estimated cost $1,500,000. Noted May 2, 1929.

Pa., Erie—General Electric Co., J. Wright, East Lake Rd., is receiving bids for the construction of a 1 story, 75 x 225 ft. factory, C. E. Schnur, c/o owner, Archt.

Pa., Manheim—Hershey Machine & Foundry Co., J. H. Missley, is having sketches made for addition to plant. Estimated cost to exceed $40,000.

Pa., New Castle—Pennsylvania Power Co., M. Moses, Local Rep., Sharon, plans the construction of a 2 story service building including work shop, garage etc. Estimated cost $100,000. Stevens & Wood, Inc., 20 Pine St., New York, Engrs.

Pa., Philadelphia—E. A. France, 6736 State Rd., will soon award contract for a 1 story, 49 x 77 ft. machine shop at State Rd. and Callman St. S. G. Matthews, 2016 Lippmeatt St., Archt.

Pa., Pittsburgh—K. Simon, 160 Fullerton St., will soon award contract for the construction of a 2 story, 45 x 65 ft. wagon shop. Estimated cost $40,000. A. R. Douglass, Benedum Trees Bldg., Archt. Noted Nov. 14.

Pa., Wilkinsburg—J. Boyd, 1208 Center Ave., will soon award contract for the construction of a 1 story, 50 x 180 ft. garage and automobile cleaning plant on Penn and Hays St. Schmertz & Fisher, McCance Block, Pittsburgh, Archts.

Tex., Dallas—Bd. of Education, c/o C. M. Moore, Bus Mgr., will receive bids about Mar. 15 for the construction of a technical high school of arts, at Gergen and North Pearl Sts. Estimated cost $175,000. H. M. Greene, Construction & Industrial Bldg., and La Roche & Dahl, Archts.

Ontario—Page Hersey Tubes Ltd., 103 Church St., Toronto, plans the construction of a seamless tube mill. Estimated cost $2,000,000. Private plans. Location not yet decided.

Ont., Callender—Pierce Lumber Co., Ferguson Block, North Bay, plans the construction of a saw mill, lath mill and picket mill including machine shop, etc. Estimated cost $100,000. Private plans.